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ABSTRACT

This guide presents a model for planning technological education programs. It presents answers to questions involving: (1) the definition of the program discipline; (2) an assessment of the real need for the program, both generally and in the locale of the institution; (3) the availability of the physical and personnel resources to mount the program; (4) the channels through which funding can be achieved; (5) the marketability of the program to the student body; (6) the support for it that might be expected from the general and industrial communities; (7) the speed with which it could be implemented; and (8) periodic evaluation of the success of the program academically and from an accountability viewpoint. The guide is divided into four parts addressing administrative prerequisites, feasibility, the proposal, and operation. (BB)

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Get them under Way !

A Developmental Guide
For the Establishment of
Baccalaureate Technological Programs

. . . and other post-secondary
Technological Programs

NATIONAL SCIENCE FOUNDATION PROJECT HES75-17321

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Fire Science
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Food Science
Food Technology
Forestry and Parks

Who Can Use Guide Effectively

As indicated in its title, the Guide is addressed specifically to those educators responsible for the establishment of baccalaureate and other post-secondary technological programs. However, the principles established are applicable over a very broad spectrum of job-related and other programs at all levels: secondary, two-year college, four-year college, post-graduate, continuing education.

This Guide was prepared with the support of National Science Foundation Grant No. HES75-17321. The opinions, findings, conclusions and recommendations expressed herein are those of the Project Staff, and do not necessarily reflect the views of NSF.

Table of Contents

Sources and Acknowledgments	4
Project Staff	5
Directions for Exploring New Horizons . . .	7
Figure 1 — PATTERNS OF INTERACTIVITY	8
Steer Clear of Shoals!	9
Structure of Guide	10
Figure 2 — MASTER FLOW CHART	11*
PART I, ADMINISTRATIVE PREREQUISITES	13
SEC. 1 — DELEGATE RESPONSIBILITY	13
SEC. 2 — ASSIGN AND SCHEDULE	13
PART II, FEASIBILITY	15
SEC. 1 — DEFINE PROGRAM	15
SEC. 2 — ASSESS NEEDS, ATTITUDES	21
SEC. 3 — INVENTORY RESOURCES	27
SEC. 4 — FORMALIZE PROGRAM STRUCTURE	31
SEC. 5 — APPRAISE BARRIERS	35
PART III, PROPOSAL	39
SEC. 1 — PLAN AND REVIEW	39
SEC. 2 — PREPARE AND PRESENT PROPOSAL	45
PART IV, OPERATION	49
SEC. 1 — IMPLEMENT, MONITOR	49
SEC. 2 — EVALUATE	53
REFERENCES	Inside Back Cover
APPENDICES	Pocket Within Inside Back Cover

* Also, for convenience in following text, Chart is on back cover flap.

Geological Engineering
Geo-Thermal Engineering

Heat, Power Technology
Housing Science

Industrial Chemistry
Industrial Engineering
Industrial Engineering Technology
Industrial Electronics
Industrial Maintenance
Industrial Management
Interior Design
Instrumentation Engineering

Labor Management
Landscape Architecture

Marine Science
Marine Technology
Mechanical Engineering
Mechanical Engineering Technology
Medical Technology
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Agricultural Engineering
Agricultural Engineering Technology
Air Conditioning Design
Architecture
Architectural Engineering
Architectural Engineering Technology
Automotive Engineering
Automotive Engineering Technology
Aviation
Aviation Technology

Biomedical Engineering
Biomedical Engineering Technology
Building Construction
Business Management

Ceramic Engineering
Chemical Engineering
Chemical Engineering Technology
Civil Engineering
Civil Engineering Technology
Commercial Art
Communications
Electronics Technology

Sources and Acknowledgments

The materials, concepts, and opinions herein summarize those of three staff National Advisory Committees (each operating independently of each other but with concurrence in their final report), a number of cooperating educational institutions and agencies and three resource personnel. The Advisory Committees provided direction and generated basic data. The educational institutions and agencies provided documented materials utilized both in the Guide and its Appendix.* The resource personnel provided invaluable assistance in their specialized areas.

Advisors, writers, researchers, and resource specialists so strongly believed in the need for this Guide that they gave generously of their time and expertise. The Project Administrators thank them for their contribution, their support, their encouragement, and, above all, for their active participation.

Acknowledged separately by source in Appendix

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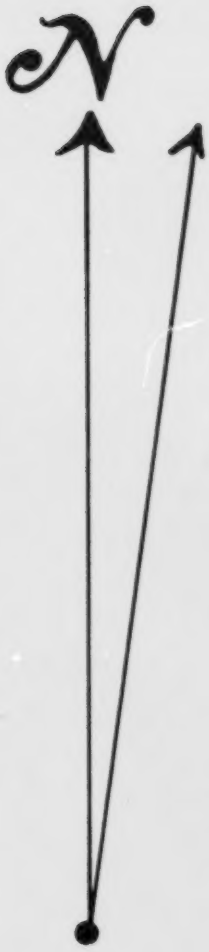
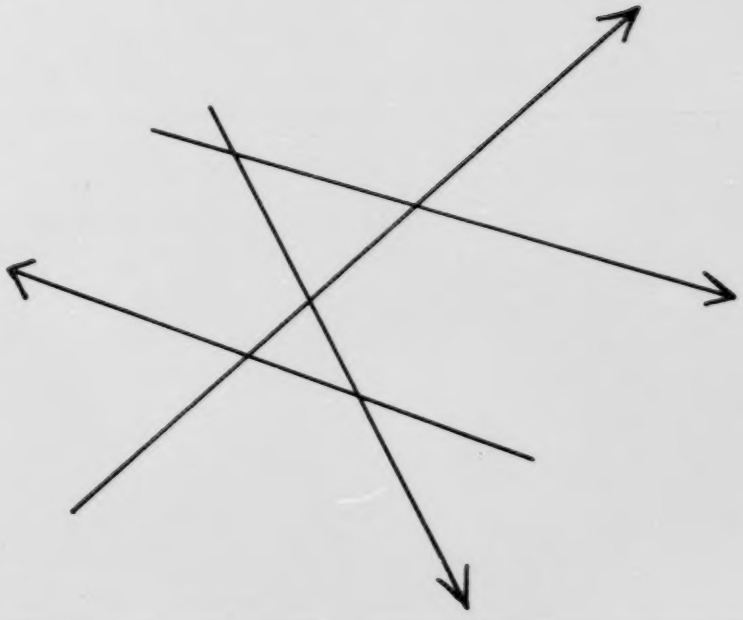




Directions?

And that's what this document is all about . . .

Directions for exploring new horizons in programming technological education

These new horizons may be summed up simply.

They are the ones which are most pressingly job related to the rapid changes in our technological society. They encompass a geometrically expanding spectrum of potential baccalaureate and post-secondary technological programs oriented to specific new employment needs of urgent immediate or major future importance.

For the strong chief administrator/educator such new horizons offer great opportunity . . . or invite disaster, if program potentials are improperly evaluated. In contrast, a complacent administrator/educator could become increasingly vulnerable merely by continuing to offer programs that had, at one time, been highly successful.

This, then, is the problem to which this Guide addresses itself.

Given A potential baccalaureate or other post-secondary program

Desired Practical, workable answers to questions involving: the precise definition of the program discipline • an assessment of the **real** need for the program, both generally and in the locale of the institution • the availability of the physical and personnel resources to mount the program • the channels through which funding can be achieved • the marketability of the program to the student body . . . and the support for it that might be expected from the general and industrial communities • the speed with which it could be implemented • periodic ongoing evaluation of the success (or lack of it) of the program academically and from an accountability viewpoint.

The Project Staff identified and carefully considered what it believes to be the most significant questions. Then, within the context of our society, within the dictates of fiscal and academic accountability and within the imperatives of new and expanding technologies, the staff made an attempt to establish appropriate professional guidelines and effectiveness criteria that take into account:

- **The needs of the students**
- **The needs of the employers**
- **The needs of the communities**
- **The needs of the faculties**
- **The needs of the cooperating institutions**

PATTERNS OF INTERACTIVITY

(Typical)

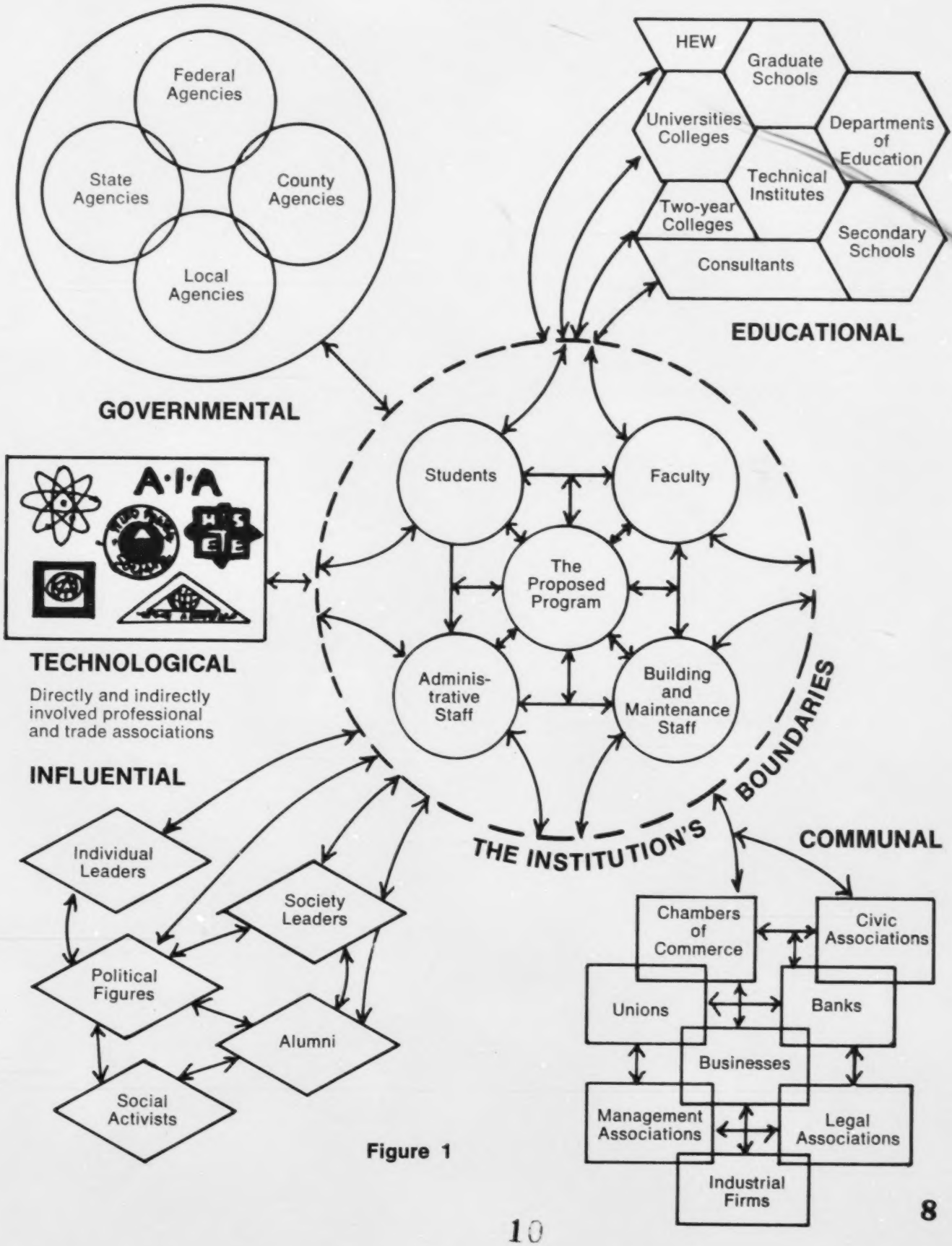
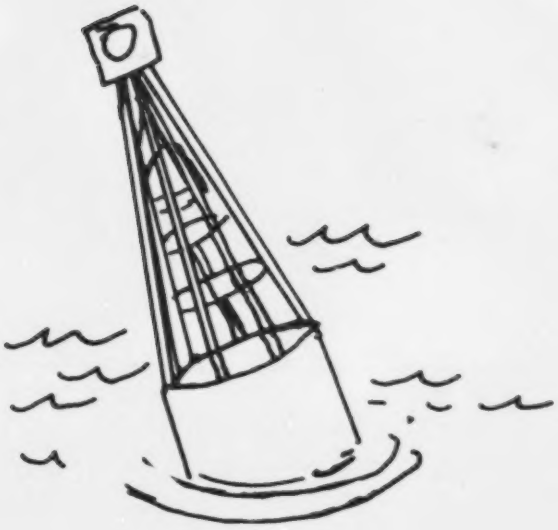


Figure 1



Steer Clear of Shoals!

In using this Guide one should recognize that a three-, four- or five-year baccalaureate technological degree program is not always appropriate. Also the two-year associate degree program is . . . and will continue to be . . . the primary educational source of trained technicians.

Similarly, there is an impressive increase in the numbers of 2-year and 4-year institutions working within the 2 plus 2 concept to provide the associate degree graduate with the option of continuing, postponing or declining further education. Off-campus, cooperative and non-traditional programs are also on the increase.

So, it behooves the educational planner to become fully aware of national and state educational guidelines and plans . . . and precisely what all neighboring post-secondary institutions are doing or planning to do within those guidelines.

Many other types of interactions are important: some technological, some communal. Some involve influential individuals, some political figures and some socially-concerned leaders — environmentalists, for example.

Still other people within the institution's own boundaries may affect or be affected by the proposed program.

All such interactive relationships warrant close study and planning if the planner is to enlist, receive and maintain academic, financial and public support for the program.

Structure of Guide

For your convenience, the material within the body of the Guide has been structured about a Master Flow Chart (Figure 2). This Chart, with "impeccable" logic, visualizes the quite improbably ordered process of developing an academically viable program in a proposed technological area subject to the dynamics of change.

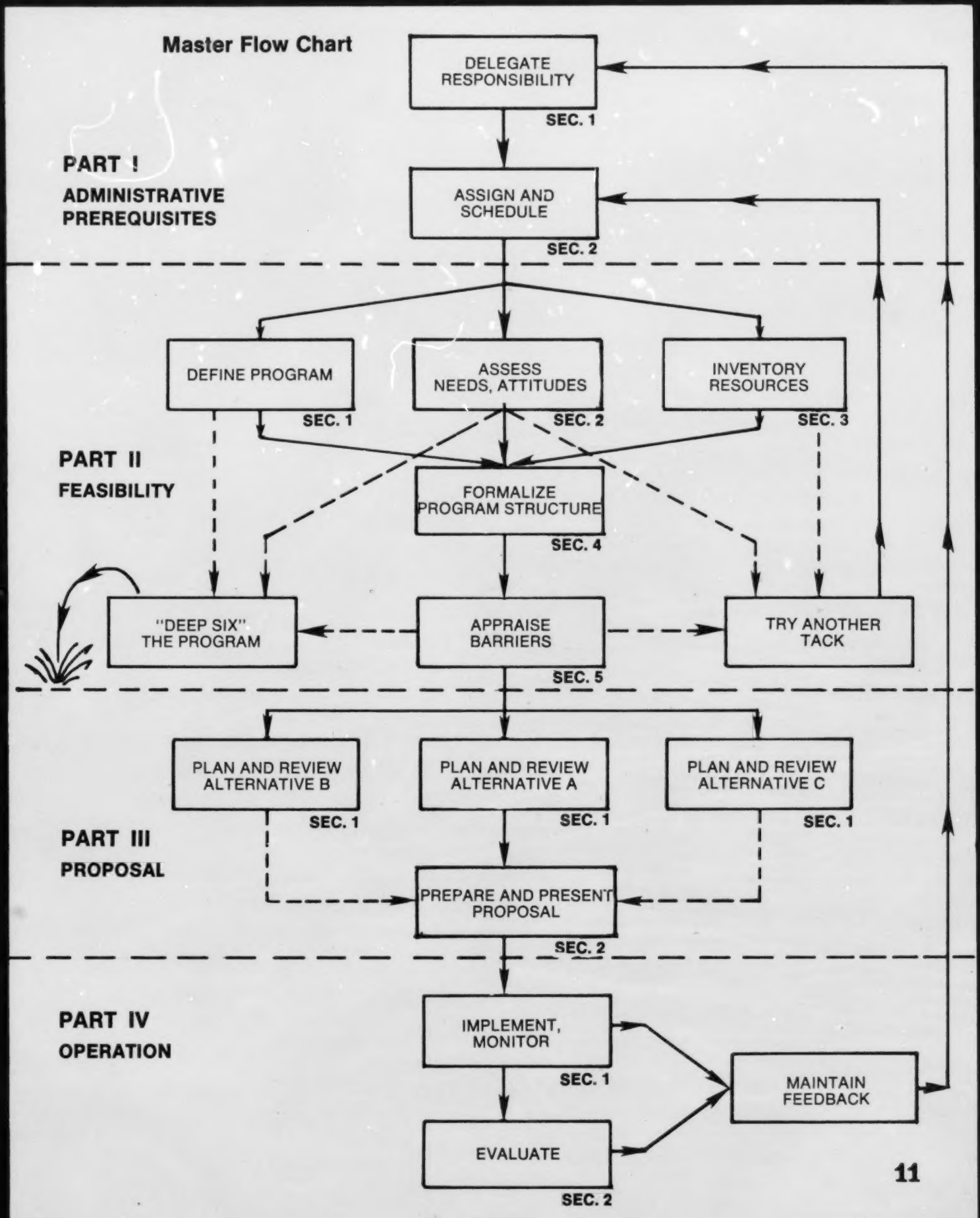
Accordingly, it is not expected that any institution can, or should, follow all the steps depicted in the Chart. After all, as we have seen in Figure 1, the interactive relationships within which a proposed program must operate are complex. Consequently, both the feasibility and the timing of any particular step may come into serious question. On the other hand, the chances for a program to succeed are likely to be greater if all the steps are at least considered in the light of those interactive relationships.

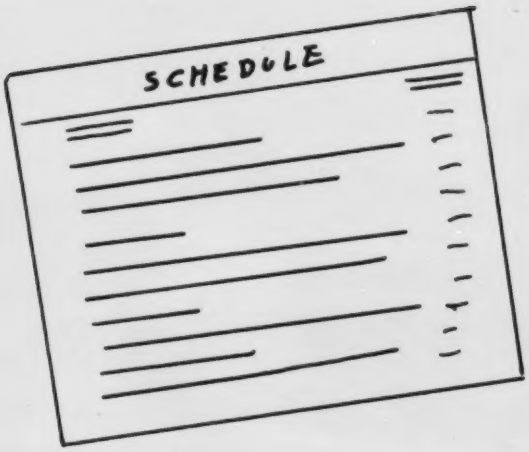
Similarly, the economics of exploring the feasibility of a new program are likely to be more favorable if the sequential order of the Chart can be approximated.

The Appendix contains examples of documents which have generated useful planning data and which may be adapted to your specific needs. Its format is physically organized to provide you with a depository for similar documents which you develop or run across.

Master Flow Chart

This chart provides a visual overview of the development of a technological program in the form of an ideal model of the process. It includes not only the process itself but also a feedback channel to insure that the implemented program is monitored with respect to the "State of the Art" of the technology in question.


Master Flow Chart
DELEGATE RESPONSIBILITY
SEC. 1
PART I
ADMINISTRATIVE PREREQUISITES
ASSIGN AND SCHEDULE
SEC. 2
DEFINE PROGRAM
SEC. 1
ASSESS NEEDS, ATTITUDES
SEC. 2
INVENTORY RESOURCES
SEC. 3
PART II
FEASIBILITY
FORMALIZE PROGRAM STRUCTURE
SEC. 4
"DEEP SIX" THE PROGRAM
APPRAISE BARRIERS
TRY ANOTHER TACK
SEC. 5
PLAN AND REVIEW ALTERNATIVE B
SEC. 1
PLAN AND REVIEW ALTERNATIVE A
SEC. 1
PLAN AND REVIEW ALTERNATIVE C
SEC. 1
PART III
PROPOSAL
PREPARE AND PRESENT PROPOSAL
SEC. 2
PART IV
OPERATION
IMPLEMENT, MONITOR
SEC. 1
MAINTAIN FEEDBACK
EVALUATE
SEC. 2
11


SCHEDULE

PART I, ADMINISTRATIVE PREREQUISITES

SEC. 1 — DELEGATE RESPONSIBILITY For A Staff Study and Proposal

Somebody . . . **not** you, because you already have more than enough to do . . . will have to do the work.

However, step number one, the delegation of responsibility and authority, is squarely up to you . . . to be done in whatever manner best suits **your** situation.

Basically the needs are uncomplicated:

1.1 — To appoint, hire or otherwise acquire some responsible person to **direct** the development effort

1.2 — To provide (probably from your existing faculty) whatever supporting advisory and working staff appears to be needed

1.3 — To allocate to this "task force" the means to underwrite basic expenses of the feasibility study. (Implementation of resulting proposals should be funded by means specified in the proposals themselves.)

SEC. 2 — ASSIGN AND SCHEDULE Staff Study Tasks

The director and staff should meet to structure and schedule the work to be done under PART II, FEASIBILITY, using the guide lines established under that heading in the pages that follow.

Hopefully, they will accomplish the following:

2.1 — Review and appraisal, as to its relevance or irrelevance to the proposal at hand, of each specific task detailed in PART II . . . with a decision made to include or drop each task in the following effort

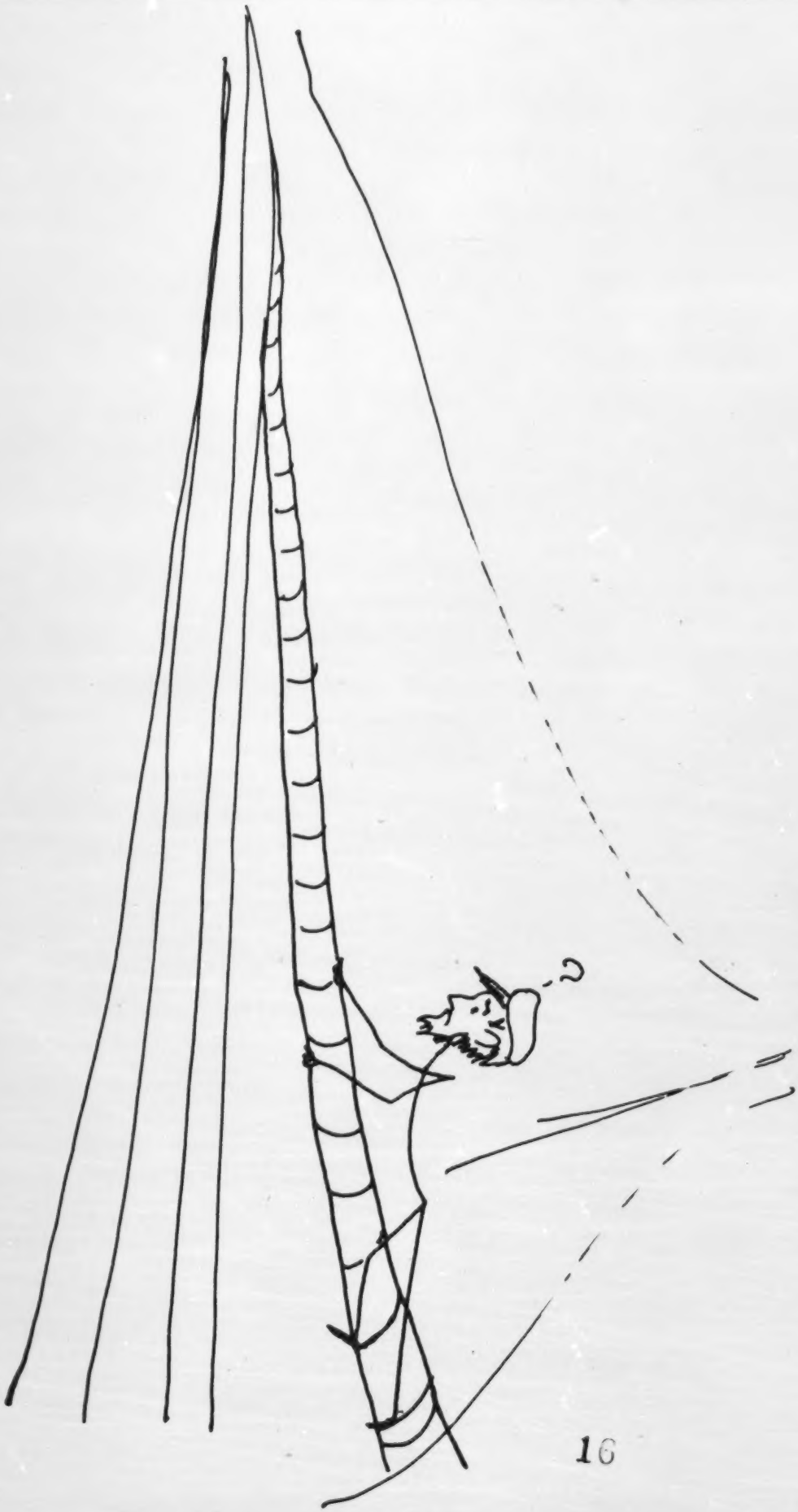
2.2 — Identification of any additional tasks relative to the proposal at hand that appear to be needed

2.3 — Estimation of the time and manpower needed to complete each task

2.4 — Assignment of each task to an individual or team

2.5 — Specification of a completion date for each task and, if deemed necessary, one or more progress report dates for each

2.6 — Establishment of a policy and a procedure for documentation



16

PART II, FEASIBILITY

SEC. 1 — DEFINE PROGRAM Within Context of Environment

1.1 — Task Checklist

A General technological area to be served?
B Basic concepts to be included in curriculum?
C Areas of employment for graduates?
D Sources (or potential sources) of students?
E Other nearby program offerings which duplicate wholly or in part the proposed program?
F Publics (communal, social, internal, political, industrial) affecting or affected by program?
G Relevant professional organizations?
H Other institutions affecting or affected by program?
I Academic units within the institution capable of housing the proposed program?
J Individual (or individuals) capable of developing the program proposal?
K Existing programs (in other institutions) addressed to the same or similar needs?
L Governing agencies responsible for reviewing, sanctioning, approving, and/or funding program?
M Support (or lack of support) for program that can be anticipated?
N Action recommendation?

1.2 — Guidelines by Tasks

In the development of a technological program clear definition is a first essential. Both the technical content of the proposed program and the desired impact on the environment in which it will be offered should be specified eventually in ways that will be readily accepted by all impacted individuals and groups.

Tasks A through L in this Section are designed to generate the date needed. Task M is directed toward making a "first order" evaluation of that data. Task N embodies two possible outputs of that evaluation. One is a "NO-GO" recommendation.

The other, of course, is a "GO" recommendation, to which all data generated within this Section is pertinent.

To a large extent each task is self-explanatory and will be accomplished as each task force finds most expedient. However, the following guidelines should prove helpful.

A Establish Technological Area to be Served

It is not sufficient to state that the proposed program is, let's say, "Construction." To some, such words suggest a civil engineering program; to others building construction; to still others construction management.

As the base for all future investigations, discussions and plans, it is an essential that everyone involved in the program development reach a common understanding free of semantic differences At the same time, it would be unwise to make premature restrictive conclusions relative to program content.

So try to keep the common understanding of what the program is as broad as possible at this stage.

B Develop General List of Basic Concepts to be Included in Curriculum

To discuss the program in a meaningful but general manner a basic frame of reference is needed. For this purpose such generalized descriptions as: "manufacturing," "maintenance," "circuit design," "structures," "management," and the like, are useful. They portray the general intent of the program without inhibiting its development by too detailed a description.

At this early stage it is not appropriate to identify the specific courses that are to be included in the program. This must wait until later study reveals the specific competencies the program will be expected to impart to graduates. This study should obviously incorporate analyses of industry's manpower needs and the competencies industry requires to meet those needs.

C Identify Potential Employers of Graduates and Opportunities for Graduate Self-Employment

A principal objective of a technological program is to produce employable graduates who exhibit acceptable levels of productivity after a reasonable period of orientation. That makes potential employers also potential full partners of the educator mounting the program. It therefore behooves the educator to identify all potential employers in industry, commerce or the public sector. Such identification will define in large part the potential market for graduates.

In some instances, however, the program may by its very nature prepare the individual for self-employment. Such information should also be made a matter of record.

D Define Sources (Including Potential Sources) of Students

Will sufficient students be interested in the proposed program? This question is often answered disastrously by intuition. Yet facts can be generated by revealing questions . . . qualitatively during the early stages, quantitatively later on.

Here are four pertinent questions:

1. Are the employment potentials in the field of the program good, and are they recognized as good by the average student (and the guidance counselor)? Or, are they, perhaps, so limited or so unknown to the average student as to make volume enrollments improbable or recruitment costly?
2. Do the principal "feeder" secondary schools produce graduates academically qualified and psychologically prepared for entry to the program? . . . and in what quantities annually?
3. Do local 2-year institutions produce graduates with appropriate transfer credits? . . . and in what quantities annually?
4. What technical institutes in the immediate geographic area equip graduates with appropriate program entry qualifications? . . . and at what rate?

E Identify Other Nearby Program Offerings Which Duplicate Wholly or in Part the Proposed Program

Prospective students, employers, funding authorities and others are sure to compare the proposed program with other existing and accessible programs. So it is important not only to identify such programs but also to assess the real extent of such duplication as may exist.

If duplication is extensive . . . and if the existing programs appear to be either absorbing the supply of potential students or meeting existing

employment needs . . . it may be desirable to abort the proposed program forthwith.

An alternative is to redefine the proposed program in directions which appear to be more needed and less directly competitive.

F Identify the Publics (Commercial, Social, Internal, Political, Industrial, Other) Which Affect or are Affected by the Proposed Program

The key to the justification for any proposed program is the relationship of its content to the various publics which it impacts and which can impact it for better or worse.

There will be many such publics, inside as well as outside the institution. For example, the political community has concerns which it can exercise both financially and otherwise. Figure 1, Page 8 suggests some of the publics to consider. There are others not shown in the illustration.

The identification of these publics, and evaluations of the impact of the program on them and of their potential reciprocal action, will become invaluable resources to the program administrator.

G Inventory Relevant Professional Organizations

It is suggested that early in the planning stages a search be made to locate all relevant professional societies. National headquarters and local chapters of such associations are a rich source of employment and curricular data.

Moreover, they often have committees to help institutions plan needed programs. They also may provide guidelines that incorporate appropriate accreditation criteria.

H Determine What Other Institutions Might Affect or be Affected by the Proposed Program

The need for effective communication encompasses a number of significant issues. As an example, one issue that has greater implications in a public institution than a private one is that of state funding. Without articulate communication other academic institutions might feel that the proposed program represents an encroachment on their established areas of responsibility. They might then be inclined to register their concern with those individuals who have an effect on potential funding. Preliminary plans should obviously include direct interaction with representatives of interested institutions in an effort to establish that: (1) the proposed program is not an indefensible duplication and (2) cooperation between the institutions in this common area of concern is in the best interest of all. This can lead to cooperative activities such as team teaching, facility sharing, joint student and faculty recruitment, etc.

I Determine the Academic Units Within the Institution Capable of Housing the Proposed Program and Assess Their Capabilities

The unit with the greatest existing or potential capabilities should, in logic, handle the preliminary program planning. It should have the following: (1) faculty interest; (2) appropriate personnel competencies; (3) initial facilities (and perhaps equipment).

Through identification of these requirements, a number of secondary factors will surface. For example:

- Is the proposed program the result of a particular interest on the part of some one faculty member?
- Is that interest founded in an "empire building" attitude . . . or in perception of real and urgent needs?

- Is there a nucleus of faculty (perhaps only a single individual) possessing the background and credibility needed to plan and implement the proposed program?
- Are there other "on- or off-campus" academic entities with physical facilities or equipment that could complement those of the unit which will probably administer the proposed program?

Through such considerations, some facts that support or refute the need for the new academic unit will be uncovered.

J Identify Individuals Capable of Developing the Program Proposal

Whether one individual is chosen or an interdisciplinary committee is formed for the purpose of developing the program proposal, one underlying principle, in particular, must be maintained. The study should be kept comprehensive in nature and unbiased in design. Personal sentiment and campus politics should not be permitted to affect the candor in which the facts are reported. It is thus the responsibiliy of the institutional administration to appoint as developers only those individuals who will search out the facts and report them accurately.

Obviously, individuals selected should have expertise in the general area to be studied. If it is shown that a need for the program exists, that there is adequate support for it and that all other evidence suggests its subsequent development, then these same individuals may serve as a nucleus of faculty for the new program.

K Inventory Existing Programs (Internal as well as External) Addressed to Same or Closely Similar Needs

At this stage, a reservoir of information should be assembled which provides data regarding academic programs in existence and which correspond to areas of interest addressed by the proposed program. Later in the planning process, this reservoir will provide data on curricular models, prerequisite requirements, faculty competencies, and facility needs.

In gathering this information, it may become apparent that this project is, in reality, defining a new technological program area. It may also be determined that faculty expertise may be difficult to acquire in sufficient quantity to implement the program. These and other areas of concern may be established as potential problems, while recognizing that their solutions will need to be addressed later in the developmental process.

L Determine Governing Agencies Responsible for Reviewing, Sanctioning, Approving, and/or Funding Program

In the early stages of program planning, it is quite helpful to identify as many as possible of the governing bodies and agencies which might be involved in the decision-making processes of program development and approval. Too often the process is halted due to the surprising revelation that an additional authority must be consulted. While formal approval may not be required of certain elements, their informal approval and subsequent support can be of unlimited value.

M Develop Intuitive Appraisal of Anticipated Support from All Relevant Groups

Items A through L are designed to provide means for assessing the climates which either foster or stifle the growth of the proposed program. To list all of the factors may well be an impossible task, for some defy a finite description. When all has been said, the reviewer will either

be encouraged or have a nagging sense of doubt with regard to the success of the proposed program.

When interviewees offer encouragement, the reviewers may feel that what was said was more "lip service" than sincere commitment. This is most difficult to document but important to note. Because the attitudes of all concerned must be strongly supportive, an expression of sincere commitment on the part of the institutional and governing authorities must be convincingly clear before proceeding.

N Recommend Next Action: to Continue or Discontinue Developmental Process

This represents the first "go — no go" decision point in the developmental process. To this point, a considerable amount of information has been gathered at the expense of invested time and energy. While few will condone the expenditure of time and effort without a suitable return on the investment, aborting the program at this point is far wiser than continuance in the face of evidence which is less than optimistic.

PART II, FEASIBILITY

SEC. 2 — ASSESS NEEDS, ATTITUDES In Specific Terms

2.1 — Task Checklist

A Goals of prospective students and annual number likely to seek them through this program?
B Goals of identified publics and probabilities that this program will advance their achievement?
C Detailed competency objectives of program?
D Projected annual needs for graduates within probable employment areas?
E Content of other programs aimed wholly or in part at similar objectives?
F Degree to which success of program is likely to advance, change or retard fulfillment of institution's overall goals and philosophy?
G Degree of acceptability of proposed program within the state or federal government?
H Recommended title and description for program?
I Summary assessment of needs, attitudes?
J Action recommendations?

2.2 — Guidelines by Tasks

In SEC. 1 the general parameters that lead to a definition of a proposed program were identified. Then suggestions were made for establishing in qualitative terms the overall dimensions of any particular proposed program.

This section provides suggestions for getting at the specifics, quantitatively wherever possible and in significant detail elsewhere. One practical way to achieve this is through the considered use of proven survey techniques: literature searches, mass mailed questionnaires, selective-expert consultation, random sampling, in-depth interviews, long-term trend analyses. Some typical survey instruments are included in the Appendix.

In the discussions that follow the references to SEC. 1 may prove helpful.

A Determine the Common Goals (Ambitions) of the Groups of Prospective Students (Paragraph 1.2D in SEC. 1). Then Project the Annual Numbers of Students from each Group that are Likely to Use the Program as the Means for Reaching Their Goals

The general numbers of prospective students in the various groups identified under the above reference might, at first view, appear impressive. However, in reality, the actual interest in the careers the proposed program addresses may be low in one or all the groups.

There may be any number of reasons for this. Certain professionals . . . a well-trained construction project manager is an example . . . have a low visibility in the public eye even though they enjoy a high demand in industry and command excellent salaries.

Another prevalent factor is the guidance . . . or lack of guidance . . . the prospective student receives in the institutions from which he will be recruited. For example, the likelihood of his having the right prerequisites for the proposed program depends on the guidance he receives.

The actual career-awareness guidance provided in a feeder institution can profoundly affect the validity of survey data from that institution. If there is concern about this, a career orientation should be presented to the student body **prior to the survey.**

During the analyses of the various groups of prospective students attention should be paid to the potentials for educational formats other than the baccalaureate which might profitably be offered concomitantly: apprentice, off-campus, continuing education and on-the-job training programs, for instance. Such concepts frequently broaden the financial base significantly, enough to more than justify the basic program. Moreover, they extend educational benefits to many more individuals, individuals who otherwise might be unable to benefit.

B Seek Out the Goals of the Various Publics Identified Earlier (Paragraph 1.2F in SEC. 1) and Evaluate the Probabilities that Program Will Advance those Goals

The financial support the proposed program will attract, particularly in a tax-supported institution, depends, in part, upon how well the objectives of the various publics affected by the program are understood by the program administrator . . . and upon how closely he aligns the program with those objectives.

Political, industrial and other leaders who directly or indirectly affect the course of socio-economic development in the state and in the community tend to react favorably when programs forward their interests . . . particularly if an early, factually-based liaison can be established with them.

Each leader and each potential employer should be contacted to open top-level and routine-liaison channels of communication. This data, along with correct names, titles, addresses, telephone numbers, should be set up in a prescribed manner and kept current.

C Establish in Detail the Competency Objectives of the Proposed Program, Taking into Account Data Developed (Paragraph A Above and Paragraphs 1.2A and 1.2B in SEC. 1)

In the last analysis, the proposed program will stand or fall on the ability of its graduates to perform effectively when employed. To this end the competency objectives of the program must be identified in detail. They can be grouped in four categories, those competencies:

1. Projected as needed by each major group of potential employers
2. Determined to be essential to top performance of individuals currently employed
3. Expected of graduates by the community at large
4. Expected of graduates who will be undertaking further education

Note this! Certain competencies will be identified under Category 2 as lacking in a significant number of persons currently employed. These needs can often be satisfied by income-generating, continuing education courses.

Note, also, that the competency objectives established for graduates of the proposed program provide insight into the competencies required of students **entering** the program. Such subjects as mathematics, science, shop, drafting, communications are obvious prerequisites for most technological programs. However, responsible academicians have pointed out that a significant portion of the technological curriculum today must include non-technical competency areas. To fulfill his future role, today's student must be aware of, and competent to deal with, the world around him.

Survey instruments appropriate to develop this type of data should be prepared for each of the four categories listed above.

D What are the Projected Annual Needs for Graduates Within Each of the Areas of Probable Employment Developed (Paragraph 1.2C, SEC. 1)? And What Competencies are Required by the Prospective Employers Within Each Area?

This information is basic to decisions affecting program directions, curricular content, faculty recruitment, resource allocations, timing, much, much more.

In developing (or adapting existing) survey instruments, determine, first, what information is essential and, second, from whom the data can be obtained most quickly, at lowest cost and with the smallest probability of error. In this connection, the data developed under B above will prove helpful.

An important secondary use of the survey instrument is to involve the respondent emotionally in the proposed program as one means of insuring his support for it later on. To this end it is important not only to make sure that the respondent is the most knowledgeable person within the employing organization, but also to make him aware that his input is among those considered to be reliable and highly valuable contributions.

In preparing questions to be asked, avoid wording that suggests that what is wanted of the respondent is curricular recommendations. It is competencies that are desired, statements such as:

- "Graduates should be able to analyze the strength characteristics of an indeterminate structure"
- "Graduates should be capable of organizing and supervising a project in machine design"
- "Graduates should be able to make and support 'make or buy' recommendations"

Minimum/maximum projections of probable employment should be sought on an annual basis for the immediate future (i.e. 4 to 8 years from **start** of program) and on a 4-year average basis thereafter.

E Determine and Evaluate in Detail the Content of the Programs (Paragraphs 1.2E and 1.2K in SEC. 1)

Academic program planners sometimes tend to be traditional in planning technological curricula when a new approach might be more appropriate. On the other hand, radical change for the sake of change often proves less than satisfactory. Therefore, it is recommended that the task force research curricula for models that best suit the perceived program needs. European models in particular should be studied.

Professional societies and accreditation agencies in the technological disciplines are usually able to provide considerable additional assistance. Recommendations from these sources, when followed, have the additional merit of simplifying program accreditation, should such sanction be sought. These organizations may already have information on comparable programs, along with individuals to contact.

The advantage of interacting with individuals from other institutions within the same geographic region is that of sharing in their experiences with local industry, public school systems, and regional institutions.

In addition, they can often point out other programs that are related to the proposed program, but not similar, such as vocational/technical or business management. Where all or parts of these programs conflict or overlap to some degree, this should be noted.

All existing programs should be categorized under one of three sub-headings: competing, complementary, or neutral. This type of assessment in the program proposal will satisfy most reviewers that sufficient attention has been given to the question of unnecessary duplication.

Competing programs are those directed, for the most part, toward the same population of potential students, and reaching for the same employment opportunities and the same faculty expertise. One area commonly cited as competing, and hence an unnnecessary duplication, is the two-year program leading to an associate degree. Often the program's faculty claim that a nearby baccalaureate program is duplicative and thus robs them of students. In reality, if the baccalaureate program incorporates provision for transfer at the end of the associate degree program, a two-year institution normally experiences an increase in enrollment. This is because individuals are attracted to two-year curricula by the available option of transferring. Usually such students more than compensate for those who by-pass the two-year institution and enter directly into the baccalaureate program.

Complementary programs are normally those offered within the same or closely contiguous institutions which incorporate courses in disciplines that complement or reinforce understanding of disciplines incorporated in the proposed program . . . or vice versa.

Examples of programs that incorporate courses which frequently complement, or are complemented by, courses in technological programs are: Business Management, Computer Science, Foreign Languages, English, Mathematics, Geology, etc.

Neutral programs or courses are those that neither compete nor complement. An excellent example is that of the relationship that exists between engineering and industrial arts (vocational teacher) education. Faculty qualifications, graduate employment opportunities, and course content are all unique to each respective program.

F Assess the Degree to Which Success of the Program is Likely to Advance, Change or Retard Fulfillment of Institution's Overall Goals and Philosophy

This is a crucial area. The most critical correlation is between the proposed program and the philosophy of the institution. When, for instance, a liberal arts college proposes to launch a technological program, the potential for problems and ultimate failure is great. Throughout the institution, faculty and administrative staff will be confronted by unfamiliar academic and philosophic criteria.

The fact should be considered, as well, that the university or college **is** its faculty. They **are** the core. They create its image. When they see that a proposed program complements their own and will advance institutional goals, there is a good chance that they will support it wholeheartedly . . . unless they see it as too strong a competitor for available funds. Where there appears to be direct duplication in whole or in part, serious, active resistance or widespread non-cooperation can be expected.

G Assess the Degree of Acceptability for the Program Within the State or Federal Governing Bodies or Agencies

A program that lacks adequate financial support during development has little hope of reaching maturity. This form of support frequently comes from governing bodies and/or state agencies. If developmental funds are to be assured, key persons must be made aware of the demand for the program and their strong commitment solicited.

With such knowledge, the leaders can justify the initial investments. Technological programs, by their very nature, are laboratory oriented. So even for a marginal program the initial investment is normally large when compared with other academic areas.

Bear in mind, too, that the facility and equipment requirements dictate class sizes and necessarily impose restrictions on enrollment revenues. Typically, technological programs exhibit lower student credit hours versus budgeted support. Initially, that ratio is even lower.

The initial staffing of a technologically competent faculty also requires a considerable investment. Those with the industrial experience have earning potentials in excess of the academic norm. This and other factors create a situation that requires real commitment from those who provide development and executive funding. Their sincere belief in the program philosophy is of the highest importance . . . and is particularly tested during planning.

H Formulate and Recommend a Title for the Program and a Brief Description of it

This is a multi-barrelled task.

- **First** Through the solicitation of titles and descriptions from key individuals identified throughout the course of accomplishing all the preceding tasks, much can be learned as to what individuals actually envision as a practical program to meet real needs. Moreover, from those who mobilize political influence, for example, the turn of a phrase may reveal a preference or bias worth noting.
- **Second** The very solicitation of help enlists desirable support . . . or pinpoints where support may be lacking.
- **Third** The precise and formal formulation of title and description by the program development task force serves to focus and clarify the thinking of all concerned.
- **Fourth** When the formal title and description are presented to the Chief Administrator who appointed the task force, his reaction will provide a meaningful measure of both the progress and the direction of the program development effort.

I Summarize and Consider the Needs and Attitudes Revealed

Do this as briefly as possible, contrasting whenever practical positive versus negative facts, opinions or reactions. If the thrust is overwhelmingly positive or negative, consider continuation or abortion of the program development. If neither, examine changes in the direction that appear to be appropriate. Look, too, at the effects a change in **timing** would produce, and consider appropriate action.

J Recommend Next Action

Once again a "go — no go" recommendation is in order. However, the data developed to date may suggest two other alternatives:

1. A change in direction (see "Try Another Tack" block in Figure 2)
2. Tabling the project pending a more favorable time or climate

PART II, FEASIBILITY

SEC. 3 — INVENTORY RESOURCES Available In-House, Attainable Elsewhere and Requiring Original Procurement

3.1 — Task Checklist

A Curriculum Development Sources?
B Instructional Material?
C Instructional Equipment?
D Personnel Needs and Availabilities?
  1. For Program Development Work
  2. For Program Start-Up and Operation
E Facility Needs and Availabilities?
F Financial Needs and Sources?
G Summary?
H Recommendations?

3.2 — Guidelines by Tasks

This section deals with basic logistics: what resources are on hand and readily available; what can be obtained fairly easily through liaison with other institutions, industry and/or the government; what must be specially procured to implement the program. Whenever possible the generated data should be quantitative.

A Tabulate Curriculum Development Resources

When it comes to formulating the program curriculum, valid concepts along with creative and knowledgeable manpower will be required. So before any further development takes place it is essential to know the sources from which to draw such concepts and, also, to identify the individuals who can be of most help in formulating the curriculum.

For example, as mentioned earlier, accrediting agencies and professional societies normally have standing committees responsible for providing assistance in formulation of the program contents and standards.

Similarly, institutions frequently form advisory committees made up of industrialists, government officials, or prominent educators.

The National Science Foundation and many other foundations and funding agencies have supported projects directed at assembling curricular materials.

Manpower needed to develop the curriculum can be found, possibly, from internal faculty members, or, possibly, from sister institutions. There are in existence, also, a number of consultants and academicians who specialize in proposal writing, in laboratory planning, in curriculum designing or in other program development work. Additionally, a number of equipment manufacturers have accumulated files of laboratory plans and equipment lists by disciplines.

All such potential sources should be identified and evaluated with respect to their potential contribution to the curriculum of the proposed program.

B Accumulate and Evaluate a Pilot File of Current Instructional Materials Covering the General Technological Area to be Served (Paragraph 1.2, SEC. 1)

Such a file serves two paramount purposes. It becomes of great value in developing curricular materials and in establishing the hierarchies of learning.

The file is also essential to the establishment of the basic and reinforcing textual and audio/video materials required for the program. It should be recognized that if the proposed program is innovative and to be kept fully updated, the faculty (or qualified consultants) will have to generate appropriate instructional materials that supplement those available in the marketplace.

C Accumulate and Evaluate a Pilot File of Technical Information on and Specifications for Laboratory Equipment Appropriate Both to Instruction and to Research in the Field of the Proposed Program

With respect to equipment acquisition, capabilities, costs and timing are essential elements of information. Frequently, other entities within the institution have equipment useful or adaptable to the program which is not in use or not being used to its capacity. Such equipment should be sought out, identified and, possibly, earmarked for the proposed program.

Based on the above, the capital needs for equipment should be projected and acquisition schedules prepared.

D Establish Personnel Needs and Appraise the Availability of Qualified Individuals

Two groups of needs exist and the availability of qualified individuals to meet each group of needs should be appraised separately. The two groups and guidelines for meeting them are treated below.

1. **Personnel for Program Development Work**
   At this point it should be clear that the planning of a sound technological program is complex, sensitive, and demands organized effort. Faculty responsible for such planning should not be expected to assume the responsibility in addition to normal teaching and other faculty loads. That released time should be granted is obvious for the above reasons alone. However, a more philosophical and subtle reason is equally important. By granting such released time the university communicates its belief in the need for the program and its willingness to invest in it. Whereas failure to commit salaried faculty time to the developmental tasks is clearly a negative indicator.

   The message is equally clear if the responsibility is delegated to inexperienced or poorly qualified faculty.

2. **Personnel for Program Start-Up and Operation**
   A professional assessment of existing personnel will determine in-house talents that can be utilized in the proposed program. For both faculty and administration, this is a very sensitive area. Many view the emergence of a new program as an opportunity to "get in on the ground floor" and make every effort to convince administrators of their capability. As an example, an engineer, though technologically competent, would be a poor choice to direct an Industrial Arts program. Accordingly, in assessing faculty and administrative staff resources, technical knowledge and a philosophical appreciation for the program should be high. It may, in fact, be politic to employ an outside consultant who can look upon each individual from an unbiased viewpoint.

   Equally important is a determination of the number, qualifications and sources for additional administrative and faculty personnel.

The existing student services staff will include those who perform such activities as student counseling, testing, and placement. To support a technological program, the only additional requirement may be merely supplementation of the staff with one or two individuals having the capability and background to operate in technological areas.

When compared to other academic areas, a technological program calls for support personnel of a different character. Consider laboratory technicians. They must be highly qualified individuals with industrial experience and enough formal education to enable ready communication with faculty and students. Staff personnel with these qualifications earn salaries commensurate with their credentials and ability, and at a level far above that normally considered appropriate for a laboratory assistant.

Clerical assistance should also be evaluated in relation to the character of technological programs, not only in numbers but also with regard to overall ability. Technical terminology **is** different, and when taken out of context for the sake of grammatical tradition often takes on completely new meanings.

E Establish Facility Needs and Availabilities Based on Probable Student Loads, Faculty and Administrative Personnel Requirements, Classroom and Laboratory Space and Services

In developing this data well known methodologies can be used effectively. However, the ability to phase capital expenditures over a four-year (or longer) gestation period may be overlooked. It should be recognized, as well, that it is often possible to reschedule capital commitments to the needs that actually develop, rather than those projected.

F Develop Pro Forma Financial Projections Based on Tenable Alternative Program-Operation Formats and Income-Generating Activities

In order to gain insight into the viability of the proposed program this task is essential.

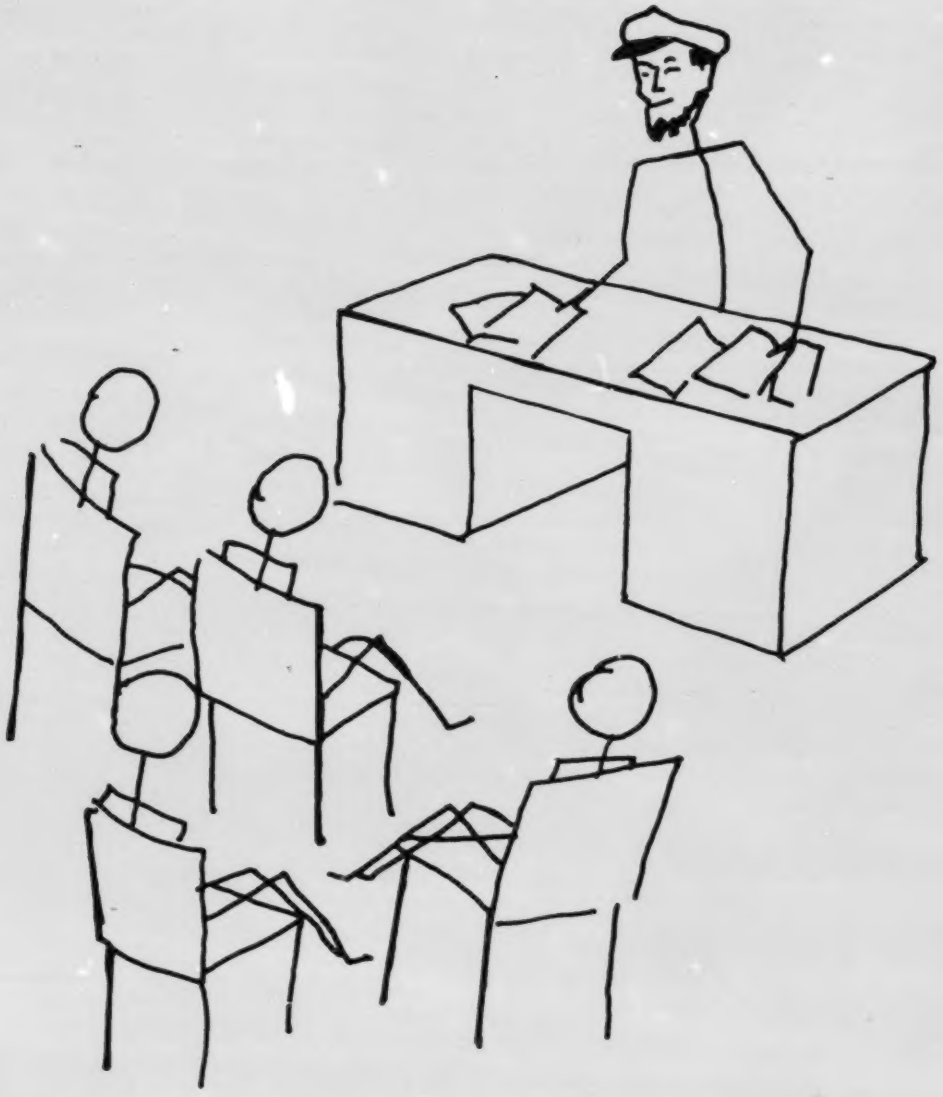
The data developed to date provides the basis for estimating probable operating budgets and capital expenditures over any desired development schedule.

With respect to income, the capabilities of income generation inherent in the proposed program should be appraised with care, taking into account such income sources as:

- Research and other grants
- Enrollment tuitions
- Formula funding based on student credit hours
- Federal and State grants
- Legislated start-up or incentive funding (or tax relief in private institutions)
- Industrial and community subsidies and/or equipment donations
- In-plant or on-campus continuing education and/or training programs
- Armed services educational contracts

G Prepare Summary of Above

H Make Appropriate Recommendations



PART II, FEASIBILITY

SEC. 4 — FORMALIZE PROGRAM STRUCTURE: Needs, Objectives, Goals, Standards, Administrator(s)

4.1 — Task Checklist

A Formal statement of needs to be addressed?
B Formal statement of achievable objectives?
C Schedule for achievement of program-development goals?
D Specifications of desired achievement standards?
E Recommendation of proposed administrator(s)?

4.2 — Guidelines by Tasks

In Sections 1, 2 and 3 guidelines were suggested for defining the proposed program in broad terms, for assessing pertinent needs and attitudes and for inventorying available resources. In paragraph 2.2H of SEC. 2 procedures for formulating a program title and description were outlined.

With this data it becomes possible to structure the program using "Management-By-Objectives" techniques. This structure should be vigorous and capable of weathering criticism from any level of authority . . . barring a major change in the foundations upon which the structure is erected.

With a fundamental structure of this type it will become possible to appraise in detail (PART II, SEC. 5) the nature of barriers to establishment of the proposed program that exist. Then means can be devised for overcoming those barriers.

A State in Specific Terms the Educational and Related Socio/Economic Needs Addressed by Proposed Program

The data for this distillation was accumulated in SEC. 2 and, in part, SEC. 1. This data, it is suggested, should be broken down into two categories and concise statements prepared covering both.

One category would include the pertinent educational and related socio/economic needs **external** to the institution. An example is the need for mechanical engineers specialized in fluid power technology.

The second category would include needs of a nature which are primarily of **internal** interest to the institution. For instance, the very existence of a program structured to provide mechanical engineers specializing in fluid power technology would establish a strong power base for generating additional revenues through fluid power technology, continuing education and technician training.

B State the Specific Objectives Which Appear to be Achievable from a Realistic Viewpoint

It should be recognized that all of the needs specified in A above may not be attainable by or compatible with the proposed program. Such needs as **are** appropriate provide the basis for defining the precise objectives of the proposed program. Often several needs will be covered by one objective. Cross-check to insure that as many needs as possible are covered. Those **not** to be addressed within the proposed program should also be listed along with rationale substantiating their omission.

C Establish a Checkpoint Schedule for the Achievement of Intermediate Program-Development Goals

At this point any such checkpoint schedule will necessarily be tentative, pending acceptance and funding of the final proposal.

In considering the schedule look at the phrase "Program-Development Goals" in a broad sense. Various categories may prove to be important. Among the more obvious are:

- Initiation of student recruitment program and dates for achievement of specified student load levels (achievement of which may signal activation of other portions of the program)
- Initiation and schedule of faculty recruitment program
- Proposed schedule for occupying (or constructing) assigned facilities
- Equipment purchase schedule
- Dates for establishment of various liaison and/or advisory committees
- Dates for achieving desired levels of research grants
- Etc.

D Determine Desired Achievement Levels and Specify Standards or Criteria for Determining the Degree of Achievement Attained

The establishment of such standards or criteria will provide the administration, the faculty and funding authorities with objective means for evaluating performance and justifying continued funding.

More importantly, they will help the faculty provide standards of education that can greatly enhance their professional stature.

E Locate and Recommend a Slate of Qualified Potential Program Administrators

The matching of manpower capability with the tasks to be performed is critical to the success of any operation of this kind. Failure to provide individuals having the required background and expertise will seriously affect institution and operation of the proposed program.

PART II, FEASIBILITY

SEC. 5 — APPRAISE BARRIERS* to Establishment of Proposed Program

5.1 — Task Checklist

5.10 Operational Barriers

A Differences between desired and probable prerequisite skills?
B Differences between economic and probable student enrollments?
C Differences between desired and available faculty expertise?
D Differences between operational requirements and available resources?
E Differences between required financial outlays and available funds?
F Differences between achievable and desirable capabilities quotients of graduates?

5.11 Attitudinal Barriers

A Differences in ways prospective students view program?
B Differences in ways potential faculty view program?
C Differences in ways educators and employers view program?
D Differences in ways various in-house groups view program?
E Differences in ways other institutions view program?
F Differences in ways various governance authorities view program?

5.2 — Guidelines by Barrier Categories

The purpose of this section is to develop definitive understandings of the most significant barriers to development of the program. What are they, precisely? And how formidable?

In the searching light of this appraisal, the institution's administrators and all concerned can answer such questions as:

- Is the proposed program feasible at all?
- Will the effort to establish it be practical in the face of other current university priorities?
- Is the need for such a program sufficient to justify the effort and/or the financial commitment?

In general the barriers usually encountered fall into either an operational or an attitudinal category.

*Substitute "OBSTACLES" if you prefer the word's semantics

5.20 Appraisals of Operational Barriers

On the whole, barriers of this type can be appraised in very factual terms. Buildings to house the program exist, or they don't, for example.

And normally the very identification of those barriers suggests one or more ways of overcoming or circumventing them.

When matters are so obvious it is not in order to belabor them. Consequently we will not treat any of the operational barriers in the check list (paragraph 5.10 above) separately, except Item F.

F Identify the Differences Between:
(1) The Capabilities Quotients of Graduates Which are Achievable by Means of the Proposed Program and (2) Those Which, Based on Guidelines Provided by Professional Associations, Accrediting Agencies and Employer Groups, Would be Desirable

When such discrepancies are identified as detrimental, an assessment should be made as to their necessity and the merits (or practicality) of action to eliminate them. Programs that violate accreditation criteria and/or professional standards may not add stature to the program or faculty.

When identified as beneficial, on the other hand, an assessment should be made as to the merits (or practicality) of enhancing them. By the degree to which a program becomes recognized as innovative and developmental with respect to the "State Of The Art," so will it attract students and faculty.

It should be recognized that circumstances exist where, for good and sufficient reasons, an administrator does not deem accreditation essential to the success of a program and does not desire it. If this feeling exists to any significant degree, the reasons for and against seeking accreditation should be carefully marshalled and reviewed.

5.21 Appraisals of Attitudinal Barriers

Barriers of this type can only be appraised in subjective and humanistic terms. Overcoming them calls into play subjective and humanistic techniques based on precise identifications of the differences identified under paragraph 5.11 above and their characters.

The basis for an effective approach to this type of problem is primarily semantic clarity (precise labeling, if you will, developed from the attitudes appraisals assessed in SEC. 2)

Skilled publicists are available to apply both advisory and executional consulting services to this type of problem. Their use is recommended. Here again, once the problem is identified the solution suggests itself . . . with the publicist organizing the means.

PART III, PROPOSAL

SEC. 1 — PLAN AND REVIEW Alternative Plans A, B . . .

1.1 — Task Objectives

A At this point, presumably, the program development task force has explored virtually all situational factors bearing on the proposed program. The documentation, again presumably, includes:

- Reasonably precise definitions of what is expected of the program
- Reasonably precise identification of the various internal and external publics that will be affected, and their attitudes and concerns
- Reasonably precise evaluations of the various employment (or further education) markets the program will serve in terms of needs and potential revenues
- Reasonably precise appraisals of the various resources at hand for mounting the program

The distillation of the above was accomplished, it is again presumed, by completing PART II, SEC. 5. Thus the task force should now have, in categorical form, lists of the operational and attitudinal barriers to development of the program, together with quantitative or qualitative appraisals of their size or difficulty.

B The purpose of **this** section (PART III, SEC. 1) is to develop one or several plans which can then be reviewed to select the specific plan upon which the formal proposal will be based. To effect this there are four tasks:

First — to systematically address each identified barrier to determine one or several **practical** ways to surmount that barrier and to assess the time required to execute each action

Second — to synthesize from the practical actions identified above (probably in outline form) one or several ways in which such actions could be combined into attainable plans

Third — to appraise the advantages and disadvantages of each plan so synthesized (with particular reference to timing)

Fourth — to decide which of the alternative plans should be developed into the formal proposal, or whether to abort the whole project.

1.2 — Guidelines by Tasks

A The Second, Third and Fourth Tasks above involve well-known standard procedures to which developers of this guide can add nothing of significance.

B With respect to the First Task above, it is appropriate to suggest that when the task force addresses itself to overcoming the various barriers, each barrier should be carefully re-examined from two points of view:

- Is the barrier being considered truly a barrier or is it simply a concern which an able administrator would take in stride?

  Consider an instance where tenured faculty has not actually taught courses containing current "State Of The Art" material. This might appear to be a barrier. However, the deficiencies in expertise could probably be overcome in a year or two by the use of a

qualified consultant, by effective liaison with one or more industrial firms or, perhaps, by part time industrial employment of faculty.

- The second point of view from which to re-examine identified barriers is to consider the possibility that a relatively minor change in objectives or parameters might nullify the barrier completely.

  The above "State-Of-The-Art" barrier, for instance, might be overcome by agreeing with the industrial advisory groups that the program's objectives should provide for the student's learning latest "State Of The Art" in industry rather than the institution. (Such a solution would be very welcome to the particular manufacturer who currently has a proprietary "State-Of-The-Art" lead on his competitors.)

1.3 — Guidelines by Categories of Barriers (PART II, SEC. 5)

1.30 Operational Barriers

A Differences between desired and probable prerequisite skills

Students will enter the program with skills developed either through previous education or within industry. Earlier analyses developed the probable entry-level skills of each group of prospective students.

The differences between **probable** entry-level skills and those that are **desirable** may be great, **and either more than or less than adequate.**

If more than adequate, consideration should be given as to whether overall objectives of the program could be broadened or raised accordingly.

If less than adequate, advice should be sought from feeder institutions as to the most appropriate ways to deal with the problem.

B Differences between economic and probable student enrollments

The differences between economic and probable student enrollments are not simple matters. Yet these differences may seriously affect the finances and the rate of program development, sometimes helpfully, sometimes harmfully.

The way a difference is viewed is important, too. There is, for instance, a significant distinction between "economic" and "optimum" enrollment. The importance of that distinction becomes clear when one examines such recent phenomena as the growth in offshore drilling, computer programming, micro-processing. Almost any program involving such high-visibility areas of technology could hardly fail to attract students in large numbers.

However, important as such technical advances are, it could be a mistake for an institution to base a major building and equipment acquisition program on such high-visibility, but perhaps fleeting, industrial developments.

A much sounder approach, usually, is to recruit faculty that is highly qualified in the broad area (of which the high-visibility phenomena is only a part). When such a faculty is supported by a similarly broad-based building and equipment program, a solid and enduring student base can be built in through the many specialization options students will have.

Considerations such as the above need to be made, and a sub-plan formulated for quickly treating each of the differences between

economic and probable student enrollments previously identified. In this way the need for special start-up funding can be significantly minimized.

C Differences between desired and available faculty expertise

The assessment of such differences is never easy. At this stage that assessment has already been made by the academic staff or by qualified consultants.

But these are quantitative factors that do not reflect the real problem: the means for overcoming the differences.

At the heart of a quality academic program there is a core of dedicated, professional faculty. Without such a core, the program is destined for mediocrity. The answer as to how that kind of core can be developed is related to pride. Quality faculty prefer to be associated with a winner. If the institution develops its reputation for quality technological programs, it can more readily attract quality faculty. But what if the institution does not have a proven track record to rely on?

Then a program head should be chosen who has national visibility in the area to be served by the proposed program. Other qualified people will then feel that the institution is committed and its program worthy of their participation.

Faculty candidates can be invited to consult in the planning process. In this way, the program benefits from their professional services. At the same time, the administration can evaluate them for possible future appointment.

It is important, too, to appraise the salaries needed to attract required faculty. However, a comparison should be made with the salaries being paid to existing faculty of similar academic rank. Many institutions find that high salaries paid to attract qualified faculty incite considerable unrest and dissatisfaction. Means should be planned to insure that existing faculty concur with any differential that is necessary.

D Differences between operational requirements and available resources

Perhaps the most important conside ation in this area is financial. But that depends almost entirely on details of the **additional** building facilities and equipment the program requires, if any. A frequently neglected factor, however, is the probability that some expenditures can be phased to the enroilment schedule and predicated upon the receipt of enrollment-based income.

Insofar as operational requirements relate to finances (as opposed to buildings or items of equipment) they become input data for "E" following.

With respect to equipment that **must** be purchased to initiate the program, exercise care to insure that items having the broadest ove:all potentials for utilization are acquired first. The same concept applies to building needs.

E Differences between required financial outlays and available funds

During the Feasibility Study these differentials were identified and quantified. It was determined, as well, that there was a reasonable probability that they could be resolved and the required support obtained.

Now it is time to develop the precise strategies for obtaining that support. The detail should include not only each basic strategy, but

also one or more practical alternatives for each.

The first step is to review the data previously developed and to incorporate it quantitatively in a pro forma that includes such major headings as:

- Faculty salaries
- Supporting staff salaries
- Building requirements
- Equipment requirements
  1. Laboratory
  2. Lecture and classroom (audio-video)
  3. Office and warehouse
- Supplies
- Travel and other expenses

The pro forma should reflect not only the funds needed, but the times at which various sums will be required.

This information must be made known as early as possible to all who are (or may become) involved in the funding process. It is important not only that these people know what funds are needed, but that they concur in the appropriateness of the need itself.

In developing this awareness and checking for concurrence, task force members should consciously search for sources of funds. Also, when possible they should seek the active help of persons involved in proposal processing and fund generation.

The end objective of this part of the task is to come up with a precisely developed statement of the program's financial needs, the possible sources of funding, the strategies for eliciting funds from each and an estimate of the amounts from each which appear to be achievable. All of this should be scheduled to the probable time when each segment of funding will become available.

The task force should take steps to see that neither they nor the institution's administrators are caught short by major changes. These might be significant changes in financial needs, such as a large increase in building costs between the early and later stages in the planning. Or they could be the emergence of new or the elimination of an existing funding source.

F Differences between achievable and desirable capability quotients of graduates

There are two primary reasons for considering the recommendations of professional societies and agencies. First, they represent the professional community with which graduates may wish to affiliate. Second, they provide a basis for professional accreditation.

However, the task force may determine that such recommendations do not coincide with the objectives previously established. In such case, simple acceptance of the professional society guidelines could nullify the benefits of the research conducted to date. Further, it would imply that local needs are of less significance than accreditation criteria. It is normally better to recognize that a cardinal obligation of an institution of higher learning is to respond to the needs of the community to which it owes its existence. When local needs do exist they deserve priority consideration. Then the justification for serving them will be the responsibility of the institution to respond to documented community needs. This documentation should be precise and supported by sufficient data.

1.31 Attitudinal Barriers

The general approach to this type of barrier is discussed in PART II, SEC. 5, Para. 5.21.

If the institution has a competent staff publicist, his services should be used. If not, outside consultation is usually in order, for this is a highly specialized field where professional help can prove invaluable.

Some words of caution, however!

First, make sure that each attitudinal barrier is clearly defined to the publicist. Use terms that detail the real atmosphere of Academia and those considerations of its publics that are relevant to the barriers in question.

Second, require from the publicist a detailed and costed sub-plan for dealing with each individual barrier and for coordinating the whole effort. It is good practice to involve the task force in the effort. It is also good practice to provide for "before and after" (and possibly monitoring) attitude surveys to measure progress.

Third, evaluate the publicist's sub-plan from a common sense viewpoint.

Fourth, remember to incorporate funding for attitudinal barrier reduction in the total proposal.

1.4 — Decision Procedure Guidelines

The fourth task objective above called for a decision as to which plan, if any, should be selected for incorporation into the formal proposal.

It is presumed that the task force has kept the institution's Chief Administrator regularly informed as to the progress of the development. If so, all that should be needed for making this selection is:

- Summary data covering the barrier reduction strategies for each possible plan
- The financial pro formas for each
- The task force recommendation

PART III, PROPOSAL

SEC. 2 — PREPARE AND PRESENT PROPOSAL

2.1 — Task Checklist

A Program and goals?
B Needs addressed?
C Critical objectives?
D Competition comparison?
E Implementation schedule?
F Required commitments?
G Provisions to meet needs?
H Success probabilities?
I Support detail?
J Presentation?

2.2 — Guidelines by Tasks

Make the proposal succinct with short descriptions and with most support details relegated to the appendix. Present essential data in an organized way under sub-headings. Base recommendations solidly on data or informed opinion (multiplicated wherever practical.)

A Describe Program and Goals

Description of the program should contain the title found to be most acceptable throughout the study. It should relate, too, to a recognized profession and the role of its graduate in industry. Include a concise presentation of support data and a short description of the curriculum.

B Describe Needs Program Will Address

Describe clearly populations to be served by the proposed program. The three major categories are: (1) types of industry and/or public agency personnel. (2) types of students from other institutions and (3) people in societal/political groups. The existence and numbers of each of these populations should be documented.

C List Critical Objectives and Criteria for Measuring Achievement

Outline the more important objectives to be attained by proposed program, including, in particular, those relating to competency standards. Then state the criteria for measuring the degree to which each is achieved. Distinguish between and correlate with quantitative and qualitative measures.

D Compare Program with Competitive Programs, Indicating Outstanding Features of Each

Competing programs should be compared to proposed program, with rationale for apparent duplication stated. Comparison should deal with the respective natures of the programs and the probable effects of their coexistence.

E Schedule Implementation of the Program Subject to Its Approval

Present, in list form, the sequence of events that must take place to implement the program. Make sure sequence reflects a time frame that is realistic and practical. Programs that are rushed into existence often suffer. The other extreme is equally unwise. Those involved want to see results and will question delays.

The schedule should also reflect the following: (1) time of year most appropriate for recruiting faculty, (2) time frames for selecting, ordering, and installing laboratory equipment, (3) time to promote program to various potential student groups and (4) opportunity to interact with industrial, political and community supporters.

F Enumerate and Schedule Commitments Required to Implement Program

These commitments will receive intensive review by those concerned with finances. A substantial portion of the information presented must be an approximation. However, it can be documented with reliable data that has been conservatively evaluated. Basically, the presentation should include resources to be created by the program itself (i.e., tuition, formula funding, etc.) and those that must be invested to initiate the program (for facilities, equipment, additional faculty, etc.). The operating budgets should be realistic, for, should the program be approved, these statements could become restrictive. For example, once a statement minimizes the importance of faculty travel it becomes most difficult to justify later requests for substantial travel. Conversely, impractically high approximations could result in the whole proposal being denied.

It is important to recognize that financial commitments may have . . . **normally will have . . .** financial impact not only on the institution but also on its staff, its faculty and its students. There are implications of moral importance also.

Consider newly-hired faculty. Based on trust that the institution has thoroughly investigated the feasibility of the program he will be in, the individual moves his family, with all that involves. Then in a year or two the program is abandoned. So, in a very real moral sense, is the faculty member, who may now have to do it all over again.

Consider, as well, the plight of a student who enrolls only to find in a few short months the need to change institutions and/or major. Maybe the student is forced into the expense of another year or two, besides.

Clearly, all concerned should look beyond the financial commitments, sensitize themselves to the human implications of their decisions.

G Describe Provisions of Program that Meet Needs of Community

This task relates to the principal needs identified in B above. One presentation document should describe clearly what parts of the program will satisfy those needs. For example, "Continuing Education classes will be offered twice weekly at Phelps Manufacturing Company." That presentation document should be pragmatic to a fault.

H Estimate Probability of Success and Substantiate Estimate

This can be difficult and should be approached with care. Yet reviewers of the proposal will be most interested in the likelihood of success, even if it is estimated. Avoid making quantitative predictions that leave little room for flexibility. So that the estimate cannot be viewed as unsubstantiated wishful thinking, present the evidence behind it.

I Incorporate Bulk of Supporting Detail in an Appendix Providing for Easy Reference

The data developed by the task force will be (as it should be) voluminous. All but the **most** pertinent should remain in the task force files. Of that selected for inclusion in the proposal, all but a quintessence belongs in the Appendix . . . with only a few golden nuggets contained within the body of the Proposal.

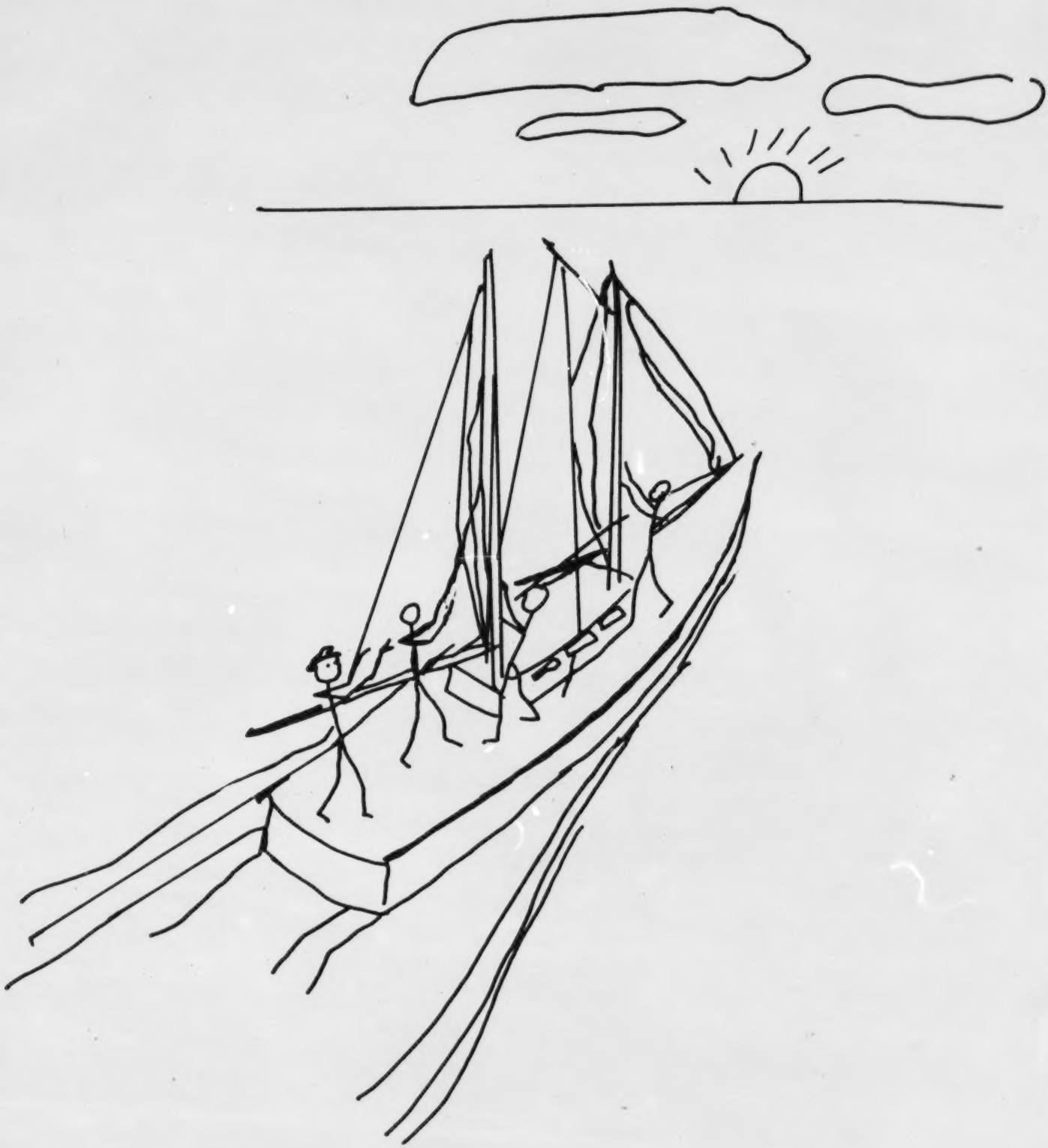
As for the material in the Appendix, organize it carefully by category, identify each piece within each category and "table-of-content" the material.

J Prepare Proposal for Both Visual and Written Presentation

Use audio-video techniques to present a fast-paced, impressive review of the facts, compressed, if possible, into thirty minutes or less. Provide for all concerned a definitive document which includes and expands on the audio-video presentation by providing supportive detail as indicated immediately above.

In developing the visual aids, plan them for multiple use with industry, with government agencies and with prospective faculty and students.

Bear in mind, too, that the reviewers of the proposal may wish to disapprove, modify or table the proposal indefinitely. Take this in stride and communicate your continued belief in the program by making it easy for them to register the precise nature of their concern. Provide a checklist-type questionnaire for them to complete with details of their objections, with suggestions or with requests for more data. Then, if it appears practical, schedule further review at the earliest opportunity.



PART IV, OPERATION

SEC. 1 — IMPLEMENT, MONITOR The Program

1.1 — Task Checklist

A Scheduling of critical events?
B Initiation of recruitment advertising?
C Activation of advisory bodies?
D Appointment of program administrator?
E Introduction of program administrator?
F Appointment and orientation of faculty and staff?
G Initiation of program?
H Activation of monitoring and control program?

1.2 — Guidelines by Tasks

In PART III a proposal based on the plan considered to be most practical was developed into a concrete proposal and presented. It is assumed, at this point, that the proposal has been accepted in whole or in part and that initial funding, at least, has been received (or scheduled for early receipt).

The next chore for the development task force is to review the plan in detail and to modify it as needed to accord with the directives generated in the course of the approval meetings.

A Finalize the Schedule of Critical Events

Under paragraphs 2.2E and 2.2F in SEC. 2, PART III, schedules were prepared for implementing the program and for coordinating the implementation to financial commitments. These schedules, in particular, should be revised. For those familiar with them, the Critical Path and PERT approaches can be useful management tools to use for this task, working backwards from the desired target date for bringing the program into operation.

Assume, for instance, that the program is to be implemented in September. Desired faculty, especially senior faculty, are likely to be employed at another institution. Their universities normally issue contracts for the coming year in the spring. Thus, selections of successful candidates should be completed well prior to that time. That means that positions should have been advertised, candidates invited for interview and final selections made sometime in the preceding fall and winter.

Even instructional laboratory equipment may take as much as six to nine months to be delivered after the order has been issued. Research equipment may take much longer. Thus, realistic scheduling should allow for evaluation of the available equipment, for selection of the most appropriate items and for probable delivery times. The availability of qualified personnel to make the installation may be a factor, too.

Where action by legislative units that convene at particular times of the year is required, the implementation schedule should take this into account.

To serve its intended purpose, promotional material should be prepared early. This should include descriptive curricular material and should be distributed to the high schools and community colleges well before the prospective students arrange for their future education.

49

In establishing target dates, incorporate a degree of flexibility so that if any date is missed it does not adversely affect others and cause a major problem.

B Initiate Recruitment Advertising

In many states advertising to fill faculty positions is a legal requirement. Nearly everywhere it is highly useful. Moreover, since lead time is long, recruitment advertising becomes a priority task. Fortunately, some of the work will already have been accomplished. The types, numbers and expertise of people needed for faculty, staff and support positions were projected in the feasibility study. Later the data was refined, with candidates for the lead positions identified, selected and perhaps, once the program received approval, even engaged.

To accomplish some of that, a Search Committee may already have been formed. If not, such a committee should now be formed, with the leading member(s) of the program's faculty appointed. The rest of the committee should include representatives from the faculty, from the student body, from the administrative staff, from the on-campus services staff and even from employers.

The first tasks of the committee should be:

- To write succinct and interesting but realistic position descriptions
- To use one or more of these position descriptions as a basis for publication and direct by-mail advertising
- To develop and activate a broad-based plan for placing these advertisements in appropriate media

The institution's Public Relations Staff as well as faculty that teaches advertising and sales promotion courses could be helpful with these three tasks.

In the advertising, be careful to keep position requirements realistic. Either over-describing the advantages or under-describing the challenge of the position can reduce the effectiveness of the advertising. Be aware, too, of the importance of credibility. Copy that ostensibly seeks a Leonardo Da Vinci man for a professorship and at the same time incorporates an age requirement of 22 would not generate many inquiries.

C Activate Advisory Groups and Individuals

Throughout the development, information and support were sought from representatives of the various publics likely to be affected by the proposed program. Now these publics should be invited to participate in the implementation activities. This immediately demonstrates that the earlier dialogue was not mere rhetoric. Instead it was the first of continuing and effective interactions.

Productive involvement of advisors includes:

- Sub-committee work in curricula development, fund raising, student recruitment, public relations
- Part-time faculty assignments on or off campus
- Plant visitations
- Cooperative education sub-programs
- Workshop participation
- Many, many other tasks

Do not forget the advisors. On the contrary, institute a specific program to keep all those who helped (and many who **didn't**) informed about the program, its faculty and its students. This can be done by direct mail and in newsletters, programs and other media produced by the institution.

D Select and Appoint Program Administrator

As indicated above, this task may already have been accomplished at the time, or soon after, the program was approved. However, the task is important and it should be performed in such a manner as to increase the probability that the best-qualified individual is chosen. The task provides, as well, a highly useful means for stressing the value of the program to the various publics.

The process should include:

- Advertising the need in a broad range of media.
- Formal reviewing of résumés forwarded in response to advertising, coupled with a detailed analysis of the supporting data. In this first review no attempt should be made to assess attitudinal characteristics.
- Sending a letter to candidates who were unsuccessful advising them of the fact, and asking whether they desire consideration for future positions.
- Corresponding with survivors of the first screening. Letter should include:
  1. Word that candidate has been selected for further consideration
  2. Request for five references from persons having differing relationships with candidate
  3. Questionnaire covering desired data missing from candidate's original application and considered essential by Search Committee
  4. Catalog and personal information about institution
- Contacting candidates' references (It is helpful to assign to this task Search Committee members whose backgrounds are similar to those of the reference.) It is desirable to make the initial contact by telephone (or in person). However, where possible, references should be asked to make their appreciations of the candidate in writing.

Search Committee members should see to it that questionnaire mentioned above contains questions that reflect the concerns that are within their own areas of responsibility.

The questionnaire should also incorporate questions that will bring out relevant attitudes of the candidates. In this way the expense of personal interviews on campus can be reduced.

The end result should be to select three to five candidates who can be invited to the campus (along with their spouses) for personal interview. In the event of each visit, a Search Committee member should be assigned to the task of orienting the candidate and spouse relative to the environment as a residence, life style and so forth.

Based on the above, final selection and engagement should be instituted.

E First Visits and Introduction of New Program Administrator

If it is assumed that the new program administrator was recruited off campus, it becomes apparent that the first visits and the introduction call for careful pre-planning.

Those who planned the program will include excellent choices for an interim on-campus coordinator who can act in behalf of the new head.

The individual appointed should handle all details of the initial visits of the new head and set up appropriate agendas.

The initial agendas should include not only coordination meetings with on-campus colleagues and staff, but also liaison meetings with representatives of all publics previously identified. The new head should have, as well, an opportunity to review all phases of the initial planning.

One most important task to schedule is a review of all proposed program descriptive literature, including the catalog description, course offerings and so forth. Perhaps the most crucial consideration is initial involvement of the new head in the selection process for the balance of the personnel needed. This would be preparatory to actual interviewing during his next visit.

He should be involved, as well, in the finalization of plans for facilities and equipment.

F Appoint and Orient Faculty and Staff

A following visit should be scheduled to provide the new head with the opportunity to interview and select prospective faculty and staff.

During this period other members of the Search Committee can orient the interviewees and, at the same time, gain insight into their attitudes. Peer level meetings should also be scheduled with industrialists relative to course offerings and provision of continuing education opportunities for their employees.

Schedule, too, review of progress in the acquisition of equipment, materials, furnishings, and supplies. Problems should be confronted and appropriate action taken.

Immediately following this period, the program head should locate in the area and begin to supervise the last preparatory activities. Every effort should be made to provide assistance to incoming faculty and staff. Attention should be given to the little bits of assistance that mean so much, especially to young faculty to whom moving is more traumatic. Assistance in finding housing, ordering telephones, and other activities will go a long way in beginning the relationship with a team-like, cooperative attitude.

Last-minute attention might be required to adjust class schedules, assign equipment and supplies, and react to the needs of prospective students.

G Begin Program

H Activate Program Monitoring and Control Procedures

PART IV, OPERATION

SEC. 2 — EVALUATE The Program

2.1 — Task Objective

If the program is to continue to meet the needs of its publics and to serve the institution's philosophy and goals, it must be kept highly responsive to the dynamic changes of our technological society.

At the same time, change simply for the sake of change can do unwarranted and costly violence. So our concern should be with **trends**, as opposed to **events.**

A continuing program of monitoring will provide the needed indicators for change and for evaluation of performance.

2.2 — Task Guidelines

The monitoring procedures can follow standard methodologies. They should be addressed to the following areas of concern:

- Is the program meeting the current goals and aspirations of students? And are the faculty and staff relating to the attitudes of the student toward the program?
- Is the program meeting the current needs and hopes of the local community?
- How well do the competencies of the graduates correspond with the needs of their prospective employers . . . from both a current and an immediate future viewpoint?
- Is the number of graduates consistent with current and projected future needs?
- Is the program continuing to satisfy needs that are relatively unique with respect to other similar programs?
- Is the program retaining compatibility with the goals and philosophies of the parent institution?
- Is the program gaining or losing credibility and acceptance from members of governing boards and state and national agencies?
- Does the program continue to enjoy a high professional reputation and status?
- How do external experts view the overall program from both a current and future viewpoint?

2.3 — Action Recommendations

Establish a means for continuously feeding back the results of the approved appraisals of **both** the faculty and the institution's academic and administrative leadership.

1. Definition of proposed Degree Program

   a. Name of college submitting the request.

      (1) Full and exact designation (degree terminology) for the proposed degree program.

      (2) Year of intended implementation.

   b. Name of the department, departments, division or other unit of the college which would offer the proposed degree program.

   c. Name, title, and rank of the individual(s) primarily responsible for drafting the proposed degree program.

   d. Objectives of the proposed degree program.

   e. List of all courses by catalog number, title, and units of credit, to be required for the proposed degree program.

   f. List of elective courses by catalog number, title, and number of units of credit which can be accepted under the proposed degree program.

   g. Explanation of special characteristics of the proposed degree program (e.g., in terminology, units of credit required, types of course work, etc.)

   h. Prerequisites and criteria for admission of students to the proposed degree program, and their continuation of it.

      (1) Admission as a Freshman.

      (2) Admission as an undergraduate transfer.

      (3) Admission from schools and colleges in foreign countries.

2. Need for the proposed degree program.

   a. List of other colleges currently offering or projecting the proposed degree program.

   b. List of neighboring institutions, public and private, currently offering the proposed degree program. Differences, if any, from these programs.

   c. Relation of the proposed degree program to the projected curricular development, respectively, of the department, division, and/or school, and college.

   d. List of other degree programs currently offered by the college which are closely related to the proposed program.

   e. enrollment figures during the past 2 years in specified courses or programs closely related to the proposed degree program.

f. Results of a formal survey indicating demand, in the geographical area served, for individuals who have earned the proposed degree and evidence of serious student interest in majoring in the proposed degree program.

g. For graduate programs, the undergraduate FTE count and Bachelor degree production over the preceding 2 years for the corresponding baccalaureate programs.

h. Professional uses of the proposed degree program.

i. Provisions for meeting accreditation requirements, if applicable.

3. Resources for the proposed degree program.

a. List of courses not now offered, by catalog number, title, and units of credit, needed to initiate the proposed degree program.

b. List of additional courses not now offered, by catalog number, title, and units of credit, needed during the first 2 years after approval of the proposed degree program, to make the program fully operative.

c. Existing library sources to support the program (specified by subject areas, volume content, periodical holdings, etc.): additional resources needed: commitment of the college to secure these additional resources.

d. List of all present faculty members, with rank, highest degree earned, and professional experience (including publications, if the proposal is for a graduate degree), who could teach in the proposed degree program.

e. Number and specific types of additional faculty and staff support positions needed to initiate the proposed degree program and to sustain it for the first five years.

f. Additional instructional materials and equipment needed in support of the proposed degree program, itemized with total cost estimates, as projected for the first five years of operation of the program.

g. Existing space and facilities that would be used in support of the proposed program.

h. Additional space and facilities required to initiate and/or sustain the program.

i. Resource analysis chart.

Credit To: School of Engineering
James Todd, Associate Dean
California State Polytechnic College
Pomona, CA
February, 1971

RESEARCH STUDY: AN ANALYSIS OF CONSTRUCTION CURRICULA ELEMENTS

PART I: PERSONAL BACKGROUND DATA

Instructions: Responses to this questionnaire will be placed on computer cards. Please read each item and place the number of the most appropriate response in the box on the right hand side of the form.

A. Present Employer (spell out) |_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|

B. Type of construction performed by your company: Primary type: |_|_|

1. High rise residential
2. Commercial
3. Institutional
4. Heavy-Highway
5. Highway
6. Utility
7. Industrial
8. Commercial-Utility
9. Commercial-Industrial
10. (Other _____)

Secondary type: |_|_|

C. Title which best describes your current position Primary title: |_|_|

1. Field engineer
2. Assistant Superintendent
3. Project Engineer
4. Superintendent
5. Estimator
6. Scheduler
7. Cost Control
8. Project Manager
9. Office Manager
10. (Other _____)

Secondary title: |_|_|

D. Years of work experience in current position:
(If less than one year, indicate one) Years: |_|_|

E. Total years of construction work experience after graduation: Years: |_|_|

F. Indicate year of graduation from undergraduate degree program: Year: |_|_|_|_|

G. Indicate undergraduate degree program in which you received your degree: Degree: |_|_|

1. Architecture - 4 year
2. Architecture - 5 year
3. Business
4. Construction - Building
5. Construction - Engineering
6. Construction - Management
7. Engineering - Civil
8. Engineering - Electrical
9. Engineering - Mechanical
10. Science
11. Social Science
12. Humanities
13. (Other _____)

H. From what institution did you receive your degree:
(Abbreviate as necessary) |_|_|_|_|_|_|_|_|_|_|_|_|_|_|

I. Have you taken courses at the graduate level: Yes |_| No |_|

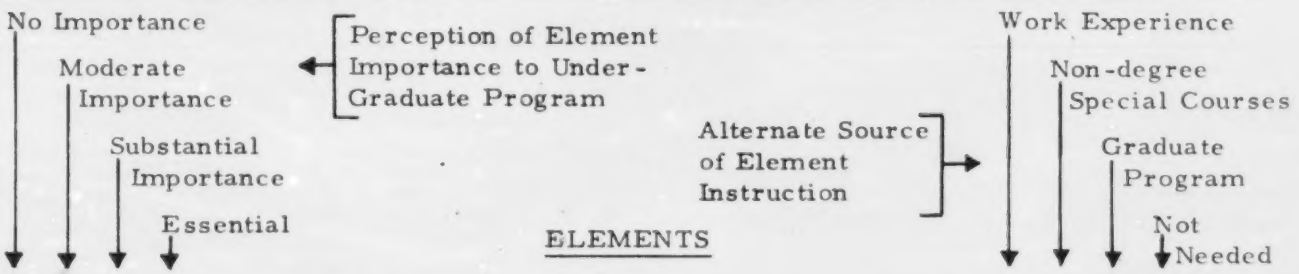
J. If you have a graduate degree, indicate type: MBA |_| MS |_| MEd |_| Ph. D |_|

K. Have you taken continuing education courses: Yes |_| No |_|

L. Are you a registered: Architect |_|_| (yes no) Professional Engineer |_|_| (yes no)

INSTRUCTIONS: On the LEFT of the listed elements, indicate the level of importance that you attach to each element as it relates to inclusion in an undergraduate construction curricula. (Mark only one square before each element.)

If you do NOT feel the element is appropriate for an undergraduate curricula, indicate in the squares on the RIGHT where instruction in this element could or should be obtained. If the element is not needed at all, use the extreme right hand column.



PART II: CONSTRUCTION AND MANAGEMENT ELEMENTS

No Importance	Moderate Importance	Substantial Importance	Essential		Element	Work Experience	Non-degree Special Courses	Graduate Program	Not Needed
☐	☐	☐	☐	1.	Orientation into construction	☐	☐	☐	☐
☐	☐	☐	☐	2.	Specifications and drawings	☐	☐	☐	☐
☐	☐	☐	☐	3.	Construction contracts	☐	☐	☐	☐
☐	☐	☐	☐	4.	Cost estimating	☐	☐	☐	☐
☐	☐	☐	☐	5.	Quantity takeoff	☐	☐	☐	☐
☐	☐	☐	☐	6.	Bidding procedures	☐	☐	☐	☐
☐	☐	☐	☐	7.	Contractor organization and operations	☐	☐	☐	☐
☐	☐	☐	☐	8.	Project organization and operations	☐	☐	☐	☐
☐	☐	☐	☐	9.	Building materials	☐	☐	☐	☐
☐	☐	☐	☐	10.	Construction equipment	☐	☐	☐	☐
☐	☐	☐	☐	11.	Construction safety	☐	☐	☐	☐
☐	☐	☐	☐	12.	Project scheduling and control	☐	☐	☐	☐
☐	☐	☐	☐	13.	Construction economics	☐	☐	☐	☐
☐	☐	☐	☐	14.	Cost control and analysis	☐	☐	☐	☐
☐	☐	☐	☐	15.	Electrical, mechanical, plumbing theory and design	☐	☐	☐	☐
☐	☐	☐	☐	16.	Electrical, mechanical, plumbing systems; estimating, coordination	☐	☐	☐	☐
☐	☐	☐	☐	17.	Systems analysis and operations research	☐	☐	☐	☐
☐	☐	☐	☐	18.	Construction cost accounting	☐	☐	☐	☐
☐	☐	☐	☐	19.	Principles of economics	☐	☐	☐	☐
☐	☐	☐	☐	20.	Principles of accounting	☐	☐	☐	☐
☐	☐	☐	☐	21.	Finance	☐	☐	☐	☐

☐	☐	☐	☐	22.	Insurance and bonding (construction)	☐	☐	☐	☐
☐	☐	☐	☐	23.	Personnel management	☐	☐	☐	☐
☐	☐	☐	☐	24.	Labor law	☐	☐	☐	☐
☐	☐	☐	☐	25.	Labor relations	☐	☐	☐	☐
☐	☐	☐	☐	26.	Business law	☐	☐	☐	☐
☐	☐	☐	☐	27.	Construction contract law	☐	☐	☐	☐
☐	☐	☐	☐	28.	Fundamentals of organization and management	☐	☐	☐	☐
☐	☐	☐	☐	29.	Fundamentals of real estate	☐	☐	☐	☐
☐	☐	☐	☐	30.	Building codes	☐	☐	☐	☐
					List additional ESSENTIAL elements				
			☐	31.	_____	☐	☐	☐	
			☐	32.	_____	☐	☐	☐	
			☐	33.	_____	☐	☐	☐	
			☐	34.	_____	☐	☐	☐	

PART III: BASIC SCIENCES AND ENGINEERING: BASIC AND APPLIED

☐	☐	☐	☐	1.	General physics	☐	☐	☐	☐
☐	☐	☐	☐	2.	Engineering physics	☐	☐	☐	☐
☐	☐	☐	☐	3.	Chemistry	☐	☐	☐	☐
☐	☐	☐	☐	4.	Geology	☐	☐	☐	☐
☐	☐	☐	☐	5.	Graphics: Mechanical	☐	☐	☐	☐
☐	☐	☐	☐	6.	Graphics: Architectural	☐	☐	☐	☐
☐	☐	☐	☐	7.	Descriptive Geometry	☐	☐	☐	☐
☐	☐	☐	☐	8.	Statistics: Business	☐	☐	☐	☐
☐	☐	☐	☐	9.	Computer programming	☐	☐	☐	☐
☐	☐	☐	☐	10.	Computer data processing	☐	☐	☐	☐
☐	☐	☐	☐	11.	Algebra	☐	☐	☐	☐
☐	☐	☐	☐	12.	Trigonometry	☐	☐	☐	☐
☐	☐	☐	☐	13.	Analytic Geometry	☐	☐	☐	☐
☐	☐	☐	☐	14.	Calculus	☐	☐	☐	☐
☐	☐	☐	☐	15.	Differential Equations	☐	☐	☐	☐
☐	☐	☐	☐	16.	Sta tics and mechanics	☐	☐	☐	☐
☐	☐	☐	☐	17.	Mechanics of materials	☐	☐	☐	☐
☐	☐	☐	☐	18.	Properties of construction materials	☐	☐	☐	☐
☐	☐	☐	☐	19.	Fundamentals of structural design	☐	☐	☐	☐
☐	☐	☐	☐	20.	Structural design: wood, concrete, steel . .	☐	☐	☐	☐

☐	☐	☐	☐	21.	Soil mechanics	☐	☐	☐	☐
☐	☐	☐	☐	22.	Hydraulics, water, sewage	☐	☐	☐	☐
☐	☐	☐	☐	23.	Foundation engineering	☐	☐	☐	☐
☐	☐	☐	☐	24.	Concrete form design	☐	☐	☐	☐
☐	☐	☐	☐	25.	Construction surveying	☐	☐	☐	☐
☐	☐	☐	☐	26.	Engineering surveying	☐	☐	☐	☐
☐	☐	☐	☐	27.	Earthwork surveying	☐	☐	☐	☐
☐	☐	☐	☐	28.	Engineering economics	☐	☐	☐	☐
☐	☐	☐	☐	29.	Advanced structural design	☐	☐	☐	☐
☐	☐	☐	☐	30.	Highway engineering	☐	☐	☐	☐
					List additional ESSENTIAL elements				
			☐	31.	_____	☐	☐	☐	
			☐	32.	_____	☐	☐	☐	
			☐	33.	_____	☐	☐	☐	
			☐	34.	_____	☐	☐	☐	

PART IV: SOCIO-HUMANISTIC STUDIES

☐	☐	☐	☐	1.	English composition	☐	☐	☐	☐
☐	☐	☐	☐	2.	Humanities: literature and fine arts	☐	☐	☐	☐
☐	☐	☐	☐	3.	Philosophy	☐	☐	☐	☐
☐	☐	☐	☐	4.	Logic	☐	☐	☐	☐
☐	☐	☐	☐	5.	Oral communications	☐	☐	☐	☐
☐	☐	☐	☐	6.	Technical report writing	☐	☐	☐	☐
☐	☐	☐	☐	7.	Professional ethics	☐	☐	☐	☐
☐	☐	☐	☐	8.	Social Science: history, government	☐	☐	☐	☐
☐	☐	☐	☐	9.	Psychology	☐	☐	☐	☐
☐	☐	☐	☐	10.	Undirected elective courses (your own choice)	☐	☐	☐	☐
☐	☐	☐	☐	11.	Directed elective courses offering alternative or advanced courses in a major area	☐	☐	☐	☐
					List additional ESSENTIAL elements				
			☐	12.	_____	☐	☐	☐	
			☐	13.	_____	☐	☐	☐	

Credit To: James W. Young, Chairman &
Associate Professor
Dept. of Construction & Architectural Technology
University of Southern Mississippi
Hattiesburg, MS 39401
August, 1976

NOVA UNIVERSITY LIFE SCIENCES CENTER
COLLEGE AVENUE, FORT LAUDERDALE, FLORIDA 33314

QUESTIONAIRE

B.S. IN NURSING CURRICULUM

Nova University is planning to offer an accredited two-year program for R.N.'s leading to the B.S. in Nursing. The tuition, inclusive of laboratory fees will be approximately $1500/year.

The following information will greatly assist us in this effort. Please complete and return. No signatures or postage are required.

Age: _____ Highest Degree: _____

Nursing Experience: _____ years.

Nursing Education - Check all degrees you now hold.

Associate _____
Diploma _____
B.S. in Nursing _____
M.S. in Nursing _____

Are you presently a candidate for the B.S. in Nursing?

Yes ____ No ____

Are you presently a candidate for the B.S. in other fields?

Yes ____ No ____

Do you plan to acquire a B.S. in Nursing?

Yes ____ No ____

Would you enroll in a B.S. nursing curriculum at Nova University?

yes ____ No ____

Attendance: Check first preference.

Two years as a full-time student _____.

Longer than two years as a part-time student _____.

Class time: Check preference.

Morning _____ Afternoon _____

If this curriculum was initiated in January 1977, would you apply for admission?

Yes ____ No ____

ASEE Annual Conference, 1976

Session 1673

Instrumentation
Experiments

Remarks of Peter C. Zanetti
Technovate, Inc., Pompano Beach, Florida

GOOD AFTERNOON, EVERYBODY!

I'M PETER ZANETTI. I WORK FOR A COMPANY WHICH IS NOW CALLED TECHNOVATE, INC. MOST OF YOU HAVE KNOWN IT FOR YEARS AS SCOTT-ENGINEERING SCIENCES.

THIS IS THE COMPANY THAT STARTED A MINOR REVOLUTION IN ENGINEERING EDUCATION SOME FOURTEEN YEARS AGO. AT THAT TIME WE BEGAN TO MARKET THE FIRST "BENCH-TOP-LABORATORY" LEARNING SYSTEMS.

THE CONCEPT GAINED ACCEPTANCE. TODAY WE SUPPLY WELL OVER 100 SUCH LEARNING SYSTEMS. MOST ARE DESIGNED FOR ENGINEERING SCHOOLS AND COLLEGES. BUT THE IDEA IS NOW PROVING EQUALLY VALID FOR INDUSTRIAL TECHNOLOGY LABS, FOR VOCATIONAL/TECHNICAL SCHOOLS, FOR IN-INDUSTRY TRAINING, EVEN FOR ELEMENTARY AND SECONDARY SCHOOLS.

IT IS THIS TREND, INCIDENTALLY, WHICH LIES BEHIND OUR 1975 CHANGE IN NAME, FROM SCOTT-ENGINEERING SCIENCES TO TECHNOVATE, INC.

DURING THE COURSE OF THIS MINOR, BUT FOURTEEN YEAR LONG, REVOLUTION IN THE TECHNOLOGY OF EDUCATION WE HAVE MAINTAINED A VERY CLOSE, SHIRT-SLEEVE, WORKING RELATIONSHIP WITH ENGINEERING EDUCATORS THROUGHOUT THE WORLD. THIS IS THE EXPERIENCE BACKGROUND WHICH MAKES ME HOPEFUL THAT I CAN CONTRIBUTE SOMETHING OF VALUE TO YOUR DELIBERATIONS THIS AFTERNOON...THOUGH I AM NOT, AND NEVER HAVE BEEN, AN EDUCATOR MYSELF.

NOW YOU KNOW BOTH MY BIAS AND MY QUALIFICATIONS. SO, LET'S GET ON WITH THE SUBJECT.

FOR STARTERS MAYBE WE SHOULD APPLY THE FIRST LAW OF ENGINEERING PRACTICE AND

DEFINE THE OBJECTIVE.

THEN WE CAN GET TO THE SECOND LAW OF ENGINEERING PRACTICE AND

ESTABLISH THE COST LEVEL.

ONCE THESE ARE IN HAND, THE BASIS FOR SPECIFICATION WRITING SHOULD BECOME CLEAR AND RELATIVELY ROUTINE.

FIRST POINT IN DEFINING OUR OBJECTIVE IS TO CALL YOUR ATTENTION TO POSSIBLE MIS-INTERPRETATION OF THIS AFTERNOON'S SUBJECT. AS STATED IN THE DIRECTORY WE ARE SUPPOSED TO TALK ABOUT:

"INSTRUMENTATION EXPERIMENTS"

OUR DISTINGUISHED MODERATOR ... AND MY GOOD FRIEND ... BRUCE JOHNSON SAYS, "NOT SO." WHAT WE ARE REALLY TO ADDRESS OURSELVES TO IS:

"INSTRUMENTATION FOR EXPERIMENTS"

HE SUGGESTS, FURTHER, THAT WE CONSIDER MOST CAREFULLY THE DEGREE TO WHICH ONE SHOULD INSTRUMENT ANY GIVEN LABORATORY.

AND THIS IS NO LIGHT MATTER. NOT WHEN ONE CONSIDERS THE COST OF MODERN INSTRUMENTATION.

NOR WHEN ONE CONSIDERS WHAT MAY BE DEMANDED OF YOUR GRADUATES BY THEIR FIRST EMPLOYERS.

IT IS IMMEDIATELY OBVIOUS THAT "TRADE-OFFS" ARE CALLED FOR ... ALONG WITH SOME SORT OF LOGICAL CRITERIA FOR MAKING THE TRADE-OFFS.

ONE SIGNIFICANT TRADE-OFF CRITERION, IN MY VIEW, LIES IN THE DIFFERENCE BETWEEN THE BASIC OBJECTIVES OF THE "REAL WORLD," SO-CALLED, AND THE "WORLD OF EDUCATION." IN THE "REAL WORLD" COST IS RELATIVE TO PROFITABILITY (AS IN INDUSTRY), OR TO RELIABILITY (AS IN A MOON SHOT.)

BUT IN THE "WORLD OF EDUCATION" COST IS AN ABSOLUTE ... WITH THE EDUCATOR ACCOUNTABLE DIRECTLY TO THE TAXPAYERS OR, IN THE CASE OF PRIVATE INSTITUTIONS, TO THE BOARD OF TRUSTEES.

IT IS ONE THING TO MAKE A CAPITAL EXPENDITURE WHICH, IN DUE COURSE, CAN BE EXPECTED TO PAY FOR ITSELF. QUITE ANOTHER TO MAKE A CAPITAL EXPENDITURE TO ACHIEVE AN EDUCATIONAL PURPOSE WHICH CAN BE OBSOLETED OVERNIGHT BY AN ADMINISTRATIVE COURSE CHANGE... OR BY AN ATTRACTIVE OFFER FROM ANOTHER INSTITUTION TO YOUR STAR PROFESSOR.

WOULD THERE BE ANYONE HERE IN THIS ROOM WHO HASN'T HAD TO "MAKE DO" WITH EQUIPMENT PURCHASED TO FURTHER SOME PET PROJECT OF HIS PREDECESSOR?

GENTLEMEN! IT GETS DOWN TO THIS. WHEN YOU BUY INSTRUCTIONAL LABORATORY EQUIPMENT AND INSTRUMENTATION YOU ARE SPENDING ABSOLUTE ... NOT RELATIVE ... DOLLARS. IN ONE WAY OR ANOTHER YOUR CHANCELLORS, YOUR CONTROLLERS, YOUR STUDENTS (AND, OF COURSE, YOUR SUCCESSORS) CAN AND WILL HOLD YOU STRICTLY ACCOUNTABLE FOR THAT EXPENDITURE.

PLEASE NOTE THAT THE OPERATIVE WORD HERE WAS INSTRUCTIONAL. WHEN YOU BUY RESEARCH ... AS OPPOSED TO INSTRUCTIONAL ... LABORATORY EQUIPMENT AND INSTRUMENTATION,ACADEMIA SUDDENLY BECOMES THE "REAL WORLD," WHERE COST IS RELATIVE ... RELATIVE TO PROFITABILITY, TO RELIABILITY, TO SPEED OF PROJECT COMPLETION OR TO SOME OTHER SHORT-TERM REQUIREMENT.

OKAY! SO THE FIRST MAJOR CONSIDERATION RELATIVE TO PLANNING EITHER THE EQUIPMENT OR THE INSTRUMENTATION FOR A LABORATORY IS TO DECIDE WHETHER THAT LABORATORY IS TO BE PRIMARILY INSTRUCTIONAL OR PRIMARILY RESEARCH.

(YOU WILL AGREE, I FEEL SURE, THAT THIRD AND FOURTH YEAR AND GRADUATE LEVEL LABS, WHILE PRIMARILY INSTRUCTIONAL,WILL NORMALLY INCLUDE SOME HIGHLY VERSATILE RESEARCH LEVEL EQUIPMENT AND INSTRUMENTATION IN ADDITION TO THE INSTRUCTIONAL LEVEL APPARATUS.)

IT IS AMAZING HOW THE RESEARCH VERSUS THE INSTRUCTIONAL LABORATORY DECISION CLARIFIES PLANNING CRITERIA.

LET ME ILLUSTRATE.

RESEARCH, BY DEFINITION, IS EXHAUSTIVE IN A RELATIVELY LIMITED SUBJECT AREA. FOR SUCH AN OBJECTIVE, SINGLE-PURPOSE, COSTLY EQUIPMENT IS COMPLETELY JUSTIFIABLE ... EQUIPMENT SUCH AS BRUCE'S 475 FOOT BY 39 FOOT HIGH PERFORMANCE TOWING TANK. AND HE COULD BE FAULTED IF HE DID NOT PROVIDE AUTOMATIC INSTRUMENTATION CAPABLE OF MAKING THOUSANDS OF HIGHLY ACCURATE MEASUREMENTS IN A SHORT TIME. CAPABLE ALSO OF ENTERING SUCH DATA IN A DATA PROCESSING SYSTEM.

IF THE RESEARCH OBJECTIVE ITSELF IS JUSTIFIED,THEN WHATEVER IS NEEDED TO DO IT PROPERLY IN THE SHORTEST TIME IS ALSO JUSTIFIED ... INCLUDING TECHNICIANS TO

WORRY ABOUT KEEPING EQUIPMENT AND INSTRUMENTATION OPERATIVE.

IN AN INSTRUCTION FACILITY VALUES ARE COMPLETELY DIFFERENT. BY DEFINITION, EDUCATION IS BROAD-BASED, ALL-ENCOMPASSING.

LET ME PAUSE HERE TO ASK YOU TO AGREE WITH ME AS TO SOME BASIC DEFINITIONS OR ASSUMPTIONS.

WE AT TECHNOVATE HAVE OBSERVED THAT EDUCATORS TEND TO THINK IN RATHER LOOSE TERMS ABOUT WHAT THEY DO FOR A LIVING. ANIMAL HANDLERS DON'T. THEY TRAIN DOGS AND HORSES ... NEVER ATTEMPT TO EDUCATE THEM. STAGE DIRECTORS AREN'T CONFUSED EITHER. THEY CON THEIR AUDIENCES TO GO ALONG WITH THEIR SIMULATIONS OF REALITY ... BUT BOTH DIRECTOR AND AUDIENCE KNOW THE THUNDER AND LIGHTNING AREN'T REAL. MANY STUDENTS, HOWEVER, ARE GRADUATED WITHOUT EVER FINDING OUT THAT THE SIMULATED LIQUID LEVEL INDICATOR IS NOT AT ALL WHAT THEY WILL FIND IN THE CHEMICAL PROCESS PLANT.

MANY MILLIONS OF TAXPAYER AND ENDOWMENT DOLLARS ARE SPENT ANNUALLY TO EQUIP LEARNING INSTITUTIONS WITH TRAINERS AND SIMULATORS. I HAVE NO QUARREL WITH THAT ... AND NEITHER SHOULD YOU ... IF, IN THE ONE CASE, TRAINING IS THE OBJECTIVE, OR, IN THE OTHER CASE, IF NON HANDS-ON GENERALIZED FAMILIARIZATION WITH THE SUBJECT TECHNOLOGY IS THE OBJECTIVE.

BUT, IN MY BOOK, NEITHER TRAINING NOR FAMILIARIZATION IS GUT-LEVEL EDUCATION.

FOR EDUCATION, THE INSTRUCTIONAL LABORATORY SHOULD PROVIDE FOR:

1. HANDS-ON EXPERIENCES OVER A BROAD SPECTRUM COVERING THE FUNDAMENTAL CONCEPTS OF THE DISCIPLINE;

2. INSTRUMENTATION WHICH ITSELF IS FUNDAMENTAL, FOR THE MOST PART MANUAL, AND, WHEREVER POSSIBLE, DIRECT-READING. AT THE INSTRUCTIONAL LEVEL THE STUDENT NEEDS TO UNDERSTAND THE PHENOMENA. HE SHOULD NOT BE CONFUSED BY THE INSTRUMENTATION. SOMETIME IN HIS UPPER-CLASS OR GRADUATE YEARS HE CAN BE INTRODUCED TO THE COMPLEXITIES OF INSTRUMENTATION TECHNOLOGY ... AS A SEPARATE SUBJECT.

THE MORE TIGHTLY YOU DEFINE YOUR INSTRUCTIONAL LABORATORY OBJECTIVES, THE MORE EFFECTIVE YOU WILL BECOME AS AN EDUCATOR. AND, IF YOU PAY REASONABLE ATTENTION TO SOME RELATIVE ADMINISTRATIVE CONSIDERATIONS, THE MORE YOU CAN EXPECT TO GET PAID FOR THAT EFFECTIVENESS.

THAT BRINGS US BACK TO OUR SECOND LAW OF ENGINEERING PRACTICE, NAMELY,

ESTABLISH THE COST LEVEL.

REMEMBER THAT ANY TRAINING DEVICE IS A SINGLE-PURPOSE DEVICE. EVEN THE UNIVERSALIZED "LINK-TYPE" TRAINERS CONFINE THEMSELVES TO PROP PLANES, OR JETS, OR COMMAND MODULES. YOU CAN'T BUY ONE THAT DOES THEM ALL.

SAME WITH SIMULATORS. THEY ONLY COVER THE LIMITED FUNCTIONS AND MALFUNCTIONS FOR WHICH THEY ARE PROGRAMMED. DID THE BATTERY INDICATOR LIGHT GO OFF BECAUSE THE BATTERY MALFUNCTION WAS CORRECTED ... OR BECAUSE THE LIGHT FAILED? OR SUPPOSE THE SIMULATOR DESIGNER FORGOT TO INCLUDE CORROSION OF THE BATTERY TERMINALS AS A MALFUNCTION?

TO KEEP THE COST OF ANY INSTRUCTIONAL LABORATORY AT THE LOWEST:

1. EQUIP AND INSTRUMENT IT FOR THE WIDEST POSSIBLE EXPERIMENTAL AND MEASUREMENT LATITUDE;

2. MAKE SURE THAT THE EXPERIMENTAL CAPABILITIES COVER THE MAXIMUM NUMBER OF THE FUNDAMENTALS OF THE DISCIPLINE;

3. MAKE SURE THAT INTEGRAL EQUIPMENT INSTRUMENTATION DOES NOT INCLUDE SUCH GENERAL PURPOSE ITEMS AS POTENTIOMETERS ... AND THAT ALL INSTRUMENTATION BE AT LOWEST LEVEL.

TO KEEP THE TOTAL INVESTMENT IN INSTRUCTIONAL LABORATORY EQUIPMENT AND INSTRUMENTATION FOR THE SCHOOL AT A MINIMUM:

1. MAKE SURE THAT THE EQUIPMENT IS MOBILE AND SELF-CONTAINED TO THE MAXIMUM DEGREE. YOU CAN'T AFFORD TO FREEZE INSTRUCTIONAL EQUIPMENT IN CONCRETE. OR TIE IT TO A $250/HOUR STEAM SYSTEM.

2. KEEP THE EQUIPMENT LIGHT ... UP TO A POINT. EVERY POUND COSTS MORE DOLLARS. ON THE OTHER HAND IT SHOULD NOT BE FLIMSY. STUDENTS ARE LESS THAN KIND TO MOST EQUIPMENT AND INSTRUMENTATION. IN THE LONG RUN STAINLESS STEEL MAY BE MUCH LESS COSTLY THAN PVC.

3. HOLD TO THE CONCEPT THAT ANY DOLLARS YOU SPEND ARE ABSOLUTE DOLLARS. THE MORE EXPERIMENTS YOU CAN DO PER SEMESTER, THE MORE SEMESTERS YOU CAN DO THEM. AND THE MORE DISCIPLINES YOUR EQUIPMENT AND INSTRUMENTATION CAN SERVE, THE LOWER YOUR COST PER EXPERIMENT.

GENTLEMEN! THANK YOU FOR YOUR PATIENCE.

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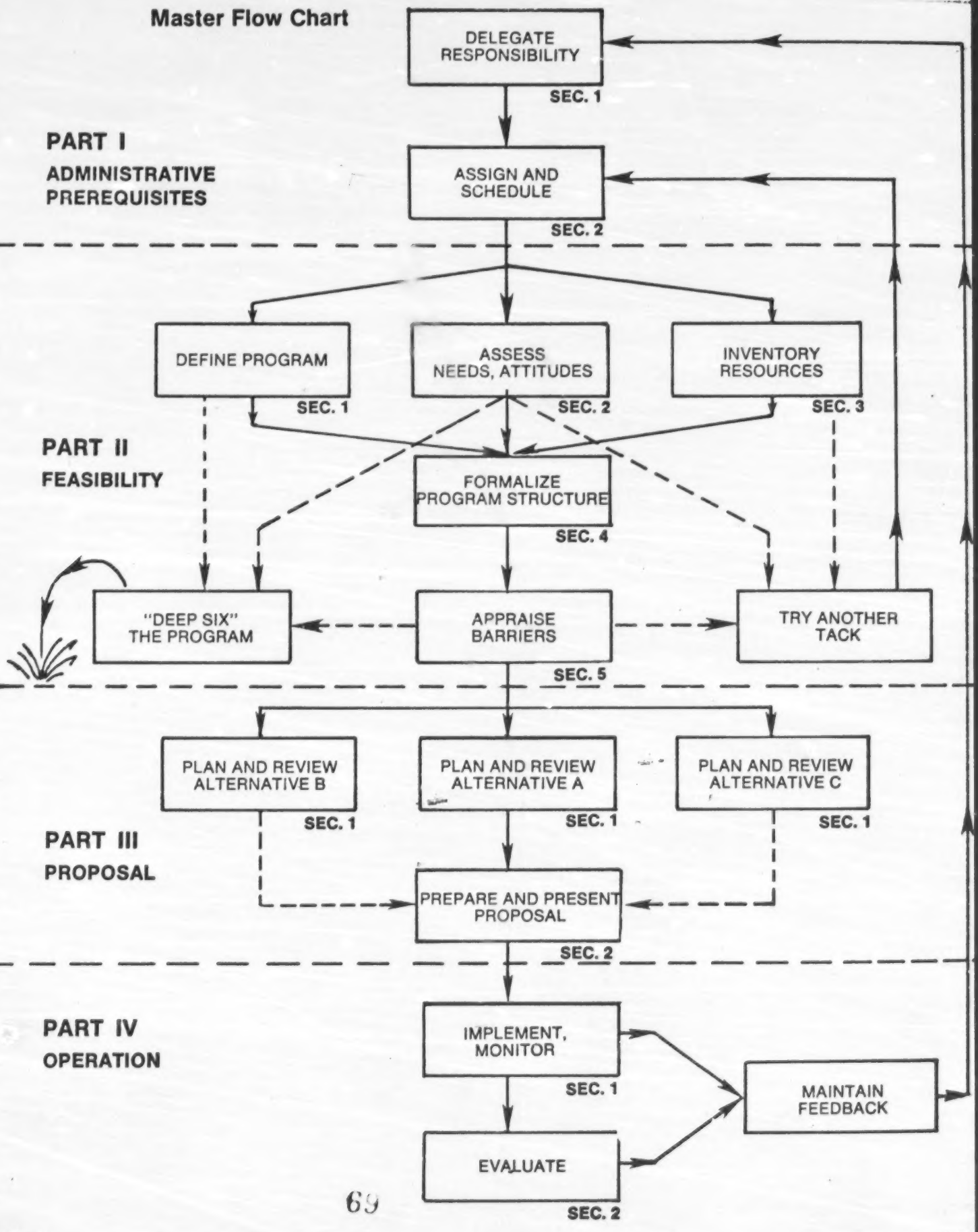
Master Flow Chart



Mechanical Engineering
Nuclear Science
Nuclear Technology
Numerical Controls
Nursing

Occupational Therapy

Petrochemical Engineering
Petrochemical Engineering Technology
Petroleum Engineering
Petroleum Engineering Technology
Plastics Engineering
Plastics Technology
Police Science Technology
Pollution Control Technology
Polymer Science
Power Mechanics Technology
Process Control Technology
Process Engineering
Production Engineering
Production Technology

Solar Engineering

Water and Wastewater Engineering

Accounting
Aeronautical Design
Aerospace Engineering
Aerospace Engineering Technology
Agribusiness Management
Agriculture
Agricultural Engineering
Agricultural Engineering Technology
Air Conditioning Design
Architecture
Architectural Engineering
Architectural Engineering Technology
Automotive Engineering
Automotive Engineering Technology
Aviation
Aviation Technology

Biomedical Engineering
Biomedical Engineering Technology
Building Construction
Business Management

Ceramic Engineering
Chemical Engineering
Chemical Engineering Technology
Civil Engineering
Civil Engineering Technology

NATIONAL SCIENCE FOUNDATION PROJECT

Get them under way!

A Developmental Guide For the Establishment of Baccalaureate Technological Programs

. . . and other post-secondary technological programs

Given A potential baccalaureate or other post-secondary program

Desired Practical, workable answers to questions involving: the precise definition of the program discipline • an assessment of the **real** need for the program, both generally and in the locale of the institution • the availability of the physical and personnel resources to mount the program • the channels through which funding can be achieved • the marketability of the program to the student body . . . and the support for it that might be expected from the general and industrial communities • the speed with which it could be implemented • periodic ongoing evaluation of the success (or lack of it) of the program academically and from an accountability viewpoint.

FREE

to those educators responsible for the establishment of baccalaureate and other post-secondary technological programs.

(1) **Type Institution**

- University ☐
- 4-Year College ☐
- 2-Year College ☐
- Graduate School ☐
- Technical Institute ☐
- Other ☐

Yes, Dr. Woolf! Please **do** send us our free copy of "Get Them Under Way . . . A Developmental Guide." The check list at left will help you and the Project Staff appraise the urgency and pertinence of our need for the guidance offered.

Name _____ Title _____

Institution _____

Address _____

City _____ State _____ Zip _____

(2) **Type Need**

We are looking into the establishment or restructuring of the following program(s):

_____ Hopefully under way by: _____

_____ _____

_____ _____

70

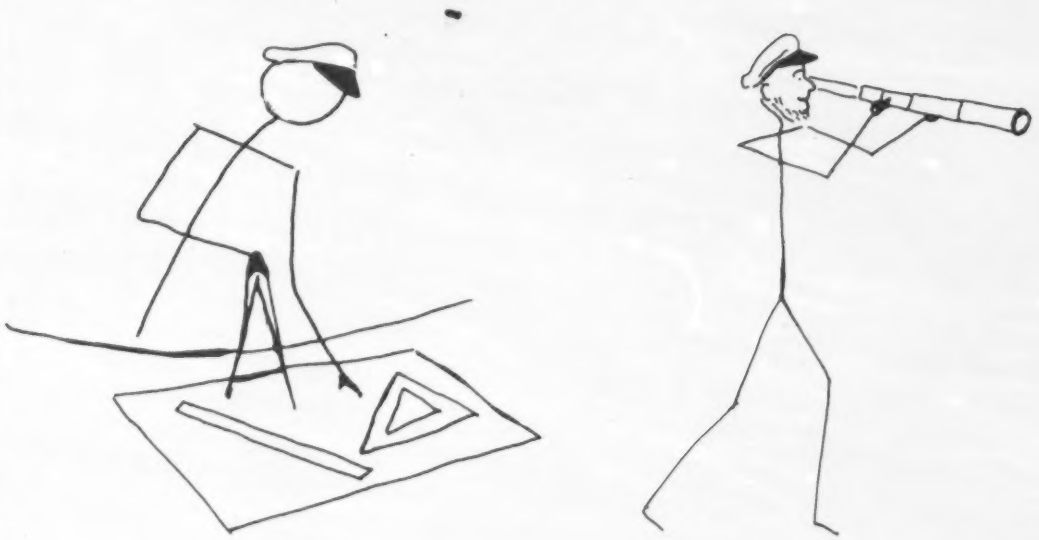
Communications
Electronics Technology
Computer Science
Computer Technology
Construction Management
Criminal Justice

Data Processing
Dental Hygiene
Dental Laboratory Technology
Drafting and Design

Electronic Engineering
Electronic Engineering Technology
Engineering Graphics
Environmental Engineering
Environmental Engineering Technology
Environmental Science

Fire Protection Technology
Fire Science
Flight Engineering Technology
Fluid Mechanics and Hydraulics
Food Processing Engineering
Food Science

Kenneth Woolf, Ed D. *Project Director*
National Science Foundation Project HES 75-17321.
Director Engineering and Technology
Delaware County Community College
Media, PA 19063



Heat, Power Technology
Housing Science

Industrial Chemistry
Industrial Engineering
Industrial Engineering Technology
Industrial Electronics
Industrial Maintenance
Industrial Management
Interior Design
Instrumentation Engineering

Labor Management
Landscape Architecture

Marine Science
Marine Technology
Mechanical Engineering
Mechanical Engineering Technology
Medical Technology
Metallurgical Engineering
Mining Engineering

Nuclear Engineering
Nuclear Science
Nuclear Technology
Numerical Controls
Nursing

Occupational Therapy

Food Technology

Forestry and Parks Administration

Geological Technology
Geo-Thermal Engineering

Heat, Power Technology
Housing Science

Industrial Chemistry
Industrial Engineering
Industrial Engineering Technology
Industrial Electronics
Industrial Maintenance
Industrial Management
Interior Design
Instrumentation Engineering

Labor Management
Landscape Architecture

Marine Science
Marine Technology
Mechanical Engineering
Mechanical Engineering Technology
Medical Technology
Metallurgical Engineering
Mining Engineering

Nuclear Engineering

Get them under Way!

A Developmental Guide